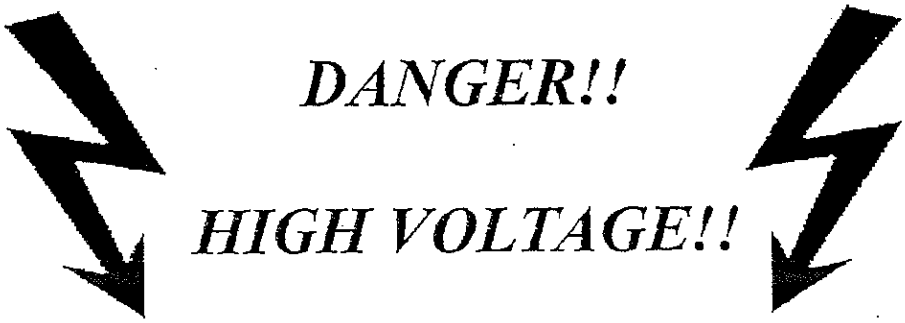
HIPOTRONICS®
THE MEASURE OF A LEADER

# *USER'S GUIDE*

MODEL: H301B, H303B, H306B

PART NUMBER: DS16-201




WARNING: This publication describes a product engineered and designed to measure or operate with HIGH VOLTAGES. Accordingly, maximum safeguards have been built into the equipment and the best safety techniques possible are described in the unit's operating instructions. These instructions caution the user to exercise great care when using certain controls at appropriate points in the operating procedures. In addition to following these written warnings, the operator of this equipment is strongly advised to maintain safety consciousness. The following rules are particularly relevant and must be followed at all times.

- BEFORE CONNECTING INPUT POWER, GROUND THE CASE.
- BEFORE UN-GROUNDING THE CASE, DISCONNECT POWER.
- NEVER APPROACH OR TOUCH A POTENTIALLY LIVE HIGH VOLTAGE CIRCUIT WITHOUT SOLIDLY CONNECTING AN APPROPRIATE GROUND CONDUCTOR FIRST.

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ILLUSTRATIONS



REV. 9/11/84

## SCOPE

This publication describes the Hipotronics H300 Series AC/DC Hipot Testers and Megohmmeters. It is intended to provide a simplified reference for users of this equipment, and to allow them to make use of its features quickly, safely, and efficiently.

Information in the body of this publication applies to all six models in the H300 Series. Information pertinent to the specific model purchased is provided in the pocket of the back cover of the publication. This includes a diagram of the control panel, a PCB assembly diagram, a schematic diagram and a Parts List.

The publication contains four major sections: General Description, Installation Instructions, Operation Instructions and Special Operations.

The General Description section describes the major features of the models in the H300 Series, and also contains a description of the functions performed by each of the controls and indicators on the control panel.

The Installation Instructions section provides step-by-step instructions for installation or set-up of the unit.

The Operation Instructions section provides step-by-step instructions for performing AC Hipot Testing, DC Hipot Testing and Resistance Measurement.

The Special Operations section describes the procedures involved in Overload Adjustment, Meter Recalibration and Trouble Shooting.

## REFERENCES

It is assumed that the user has a basic understanding of the handling of electrical equipment and the major functions to be performed by the equipment to be used. An outline of the functions, features and specifications of the Hipotronics H300 Series of AC/DC Hipot Testers and Megohmmeters is provided in Hipotronics Brochure Number HP7107. Valuable information is also contained in the American Society for Testing Materials (ASTM) standards and specifications D149, D257, D1389 and D1711.

## GENERAL DESCRIPTION

This section is intended to acquaint the user with the major features of the models in the Hipotronics H300 Series, and the functions performed by each of the controls and indicators on the control panel.

## FEATURES AND SPECIFICATIONS

Test sets in the Hipotroncs H300 Series perform three major functions:

1. AC Hipot Testing
2. DC Hipot Testing
3. Resistance Measurement

Hipot Testing is the process of testing the dielectric strength of the insulation and measuring the amount of current leakage through the insulation in a test sample at a chosen voltage. Resistance Measurement is the process of measuring the resistance (in megohms) of the insulation in a test sample at 500 volts output.

The H300 Series consists of six models subdivided into three sub-series H301, H303 and H306 based on output voltage range. Each sub-series is available in two versions, A and B, based on the number of ranges provided for current readings and resistance readings. The table in Figure 1. lists the six available models along with the specifications unique to each model.

| | OUTPUT VOLTAGE (KV) | | | CURRENT METER RANGE DC | | MEGOHMMETER RANGE MEGOHMS) | |
|---|---|---|---|---|---|---|---|
| MODEL | AC | DC | AC | "A" VERSION (3 RANGES) | "B" VERSION (5 RANGES) | "A" VERSION (2 RANGES) | "B" VERSION (5 RANGES) |
| H301 (A&B) | 1.0 | 1.5 | 0-5 mA | 0-5000 µA | 0-5000 µA | 1-1000 | .1-100,000 |
| H303 (A&B) | 2.5 | 3.0 | 0-5 mA | 0-5000 µA | 0-5000 µA | 1-1000 | .1-100,000 |
| H306 (A&B) | 5.0 | 6.0 | 0-5 mA | 0-5000 µA | 0-5000 µA | 1-1000 | .1-100,000 |

FIGURE 1. - SPECIFICATIONS OF MODELS IN H300 SERIES

All models operate from an input of 115 volts AC, 50/60 Hz, 3 amp; rated output current is 5 mA. Features include a two-range kV meter, adjustable voltage control, fault light and reset button, input power switch, fuse and indicator lights. Optional extras include an audible failure signal, HV test probe, and gravity-operated output shorting solenoid with discharge resistor.

All units are constructed with a standard 19" panel, and enclosed in an attractive bench-top cabinet. Included with each unit is a ground lead and a shielded test lead. A HV test probe may also be included as an optional extra.

## CONTROLS AND INDICATORS

A diagram of the Control Panel for your particular model in the H300 Series is contained in the pocket at the back of this publication. This diagram should be referred to when following the installation and operating instructins. The various controls and indicators, their functions and use, are described below.

## VOLTMETER AND CONTROLS

The voltmeter is the left window on the control panel, and indicates the AC or DC output voltage in kilovolts, as indicated by the label "AC/DC KILOVOLTS" on the scale. The numbers above the meter markings indicate the kilovolt output when the VOLTAGE RANGE control is set on HIGH. The numbers below the meter markings indicate the kilovolt output when the VOLTAGE RANGE control is set on LOW.

Output voltage is regulated by means of the RAISE VOLTAGE control. Markings on the RAISE VOLTAGE control indicate a percentage by which the voltage may be increased.

The user is cautioned to keep the RAISE VOLTAGE control set on "0" when not in use, and to lower the control back to "0" immediately upon completion of a test.

## CURRENT METER

The Current Meter is the right window on the control panel, and is used to indicate the ac or dc output current or to measure resistance in megohms.

The meter markings above the scale indicate resistance in MEGOHMS. Note that the direct-reading megohm scale is non-linear, i.e., the meter markings are not proportionately spaced or numbered. This allows for more precise megohm measurements at the lower numbered readings.

The meter markings below the scale indicate output current, the black numbers specifying dc output in microamps (DC MICROAMPERES), the red numbers specifying ac output in milliamps (AC MILLIAMPERES).

## MULTIPLIER AND OUTPUT

When performing AC Hipot Testing, the MULTIPLIER & OUTPUT control is set at 5 mA ac, and readings of 0-5 milliamperes are obtained (red numbers on scale). When performing DC Hipot Testing or Resistance Measurement, the MULTIPLIER & OUTPUT control allows for readings of current or resistance in a number of ranges. This permits accurate readings of current and resistance for a much broader overall range, e.g., .1 to 100,000 megohms on "B" units instead of simply .1-10 megohms.

To obtain the proper dc readings from the Current Meter, simply multiply the reading on the scale by the value indicated at the range to which the MULTIPLIER and OUTPUT control is set. The values associated with the various range settings are shown in Figure 2.

| SETTING | VALUE | SETTING | VALUE |
|---|---|---|---|
| X,1 | .1 | $X10^2$ | 100 |
| X1 | 1 | $X10^3$ | 1,000 |
| X10 | 10 | $X10^4$ | 10,000 |

Figure 2 - Value Equivalents of Range Settings

Example 1. In measuring insulation resistance, current meter reads "4" on the MEGOHMS scale, with MULTIPLIER & OUTPUT control set at X10 (Megohms). Proper reading is therefore 4 x 10 or 40 MΩ.

Example 2. In performing dc hipot test, current meter reads ".2" on DC MICROAMPERES scale, with MULTIPLIER & OUTPUT control set at $X10^2$. Proper reading is therefore .2 x 100 or 20 µA.

METER ZERO

The METER ZERO control is used to set the current meter to zero when the unit is turned on.

OVERLOAD

The three OVERLOAD controls FAILURE, RESET and SENS are used during hipot testing. The red FAILURE indicator lights up when leakage current from the test sample exceeds the overload (SENS) setting. (An audible FAILURE signal is an optional extra.) The red RESET button must be pressed following a failure, to turn off signal(s) and to permit further testing. The SENS control provides the means for adjusting the overload from 50 µA (MAX sensitivity) to 5.5 mA (MIN sensitivity). In ac mode, maximum useable sensitivity is approximately 300 µA.

AC POWER CONTROLS

The AC POWER section of the control panel contains a toggle switch (labeled ON) for the unit, the AC POWER indicator that lights up when the unit is ON, and a 3 amp (# A) fuse. The fuse may be accessed for replacement by pressing the black cap down while turning it counterclockwise.

EXTERNAL INTERLOCK PROVISION

This provision is provided for operator safety and is used with an external switch (e.g. switch mounted on test cage door)> The switch contacts must be closed in order to energize the high voltage.

## OUTPUT RE-ENTRY BUSHINGS

On each side of the control panel is an output re-entry bushing, through which the output voltage is applied. The AC OUT RE-ENTRY BUSHING is used when performing AC Hipot Testing, the DC OUT RE-ENTRY BUSHING when performing DC Hipot Testing or Resistance Measurement. When unit is operating, both re-entry bushings are energized regardless of the test being performed. The user is therefore cautioned to avoid contact with the unused re-entry bushing when unit is ON.

## GUARD POSTS

GUARD POSTS are the white posts located on each side of the control panel. They allow the user to measure leakage current only from the sample or portion of the sample being tested. This is done by connecting other conductors or potential conductors of current individually or collectively to a GUARD POST. The user should be aware that use of the GUARD POSTS can result in an inconsistency between current meter readings and actual current sensed by the overload circuit. (See Note in section, "Overload Adjustment".)

## GROUND POSTS

GROUND POSTS are the brass posts located on each side of the control panel. They are used to complete the circuit when testing, and as a safety factor.

## FUNCTION INDICATORS

The function indicators, located above the GUARD POSTS and output re-entry bushings on each side of the control panel, denote whether ac output or dc output is being metered. The indicator that will glow is dependent on the setting of the MULTIPLIER & OUTPUT control. If the control is set at any other range setting, the dc indicator will glow.

INSTALLATION INSTRUCTIONS

This section provides step-by-step instructions for the installation or set-up of the H300 Series Hipot Testers.

1. Select a location for the unit that will place the meters at eye level to allow for maximum accuracy in readings.

2. Set RAISE VOLTAGE control to "0", and check to ensure that AC POWER switch is in OFF (down) position.

3. Ground case before connecting input power. A GROUND POST on the control panel may be used for this purpose.

4. EXTERNAL INTERLOCK (EXT INTLK) - Remove back panel of cabinet. In the rear of the unit there is an 8-position terminal board. Positions 4 and 5 are the EXTERNAL INTERLOCK PROVISION. There is a jumper put on at the factory. To install an external switch, remove the jumper and wire the external switch to positions 4 and 5. Note: The switch contacts must be closed in order to energize HV.

5. Plug line cord of unit into 115 volt, 50/60 Hz outlet. If a two-prong adapter is used, be sure to ground the pigtail.

6. Turn AC POWER switch ON (up position). Allow one minute warmup time for "A" Models, two minutes for "B" Models.

7. On "B" Models, set current meter to "0" using METER ZERO control. It is suggested that the user check the current meter for "drifting" (from the zero point) after a few minutes and before beginning testing operations. If drifting has occurred, readjust current meter to "0" using METER ZERO control.

## OPERATION INSTRUCTIONS

This section provides step-by-step instructions for performing the three major test functions: AC Hipot Testing, DC Hipot Testing and Resistance Measurement. Prior to performing any of these functions, the procedures described in the preceding section, "INSTALLATION INSTRUCTIONS", must be performed.

### AC HIPOT TESTING

1. Ensure that unit is properly grounded and the RAISE VOLTAGE control is set at "0".
2. Ensure that AC POWER is ON. On "B" units, ensure that current meter is not "drifting".
3. Set MULTIPLIER & OUTPUT control at 5 mA ac (setting indicated in red).
4. Set OVERLOAD to desired sensitivity. (See "OVERLOAD ADJUSTMENT", pg. 10.)
5. Select desired VOLTAGE RANGE (LOW or HIGH) for voltmeter readings.
6. Attach the HV Shielded test lead (supplied with unit) into the ac out re-entry bushing.
7. Connect low side of test sample to a GROUND POST. (Ground lead supplied with unit may be used for this purpose.)
8. Connect alligator clip of shielded test lead to high side of test sample.
9. To ensure that only leakage current from the test sample is recorded on the current meter, any other potential sources of leakage in or near the test sample should be connected to a GUARD POST.
10. Increase output voltage to desired level via RAISE VOLTAGE control.
11. Maintain output voltage at desired level for required amount of test time. Note reading on current meter.
12. Reduce RAISE VOLTAGE control back to "0" and await return of voltmeter reading to "0".
13. If test sample breaks down, OVERLOAD will trip FAILURE signal, in which case RESET button must be pressed after RAISE VOLTAGE is reduced to "0".
14. To resume testing, check to ensure that voltmeter reads "0", disconnect leads from test sample and begin again at step 7.

DC HIPOT TESTING

1. Ensure that unit is properly grounded and that RAISE VOLTAGE control is set at "0".

2. Ensure that AC POWER is ON. On "B" units, ensure that current meter is not "drifting".

3. Set MULTIPLIER & OUTPUT control to appropriate MICROAMPS range setting. To locate appropriate range, it is suggested that the user start at the highest range setting ($X10^2$ on "A" units, $X10^4$ on "B" units.)

4. Set OVERLOAD to desired sensitivity. (See "OVERLOAD ADJUSTMENT", pg. 10.)

5. Select desired VOLTANGE RANGE (LOW or HIGH) for voltmeter readings.

6. Attach the HV Shielded test lead (supplied with unit) into the dc out re-entry bushing.

7. Connect low side of test sample to a GROUND POST. (Ground lead supplied with unit may be used for this purpose.)

8. Connect alligator clip of shielded test lead to high side of test sample.

9. To ensure that only leakage current from the test sample is recorded on the current meter, any other potential sources of leakage in or near the test sample should be connected to a GUARD POST.

10. Increase output voltage to desired level via RAISE VOLTAGE control.

11. Maintain output voltage at desired level for required amount of test time. Note reading on current meter, using appropriate value as described in "MULTIPLIER & OUTPUT", pg. 3.

12. Reduce RAISE VOLTAGE control back to "0", and await return of voltmeter reading to "0".

13. If test sample breaks down, OVERLOAD will trip FAILURE signal, in which case RESET button must be pressed after RAISE VOLTAGE is reduced to "0".

14. To resume testing, check to ensure that voltmeter reads "0", disconnect leads from test sample and being again at step 7.

RESISTANCE MEASUREMENT

1. Ensure that unit is properly grounded and that RAISE VOLTAGE control is set at "0".

2. Ensure that AC POWER is ON. On "B" units, ensure that current meter is not "drifting".

3. Set MULTIPLIER & OUTPUT control to appropriate MEGOHMS range setting. To locate appropriate range, it is suggested that the user start at the highest range setting (X10 on "A" units, $X10^3$ on "B" units).

4. Set VOLTAGE RANGE control on LOW.

5. Attach the HV shielded test lead (supplied with unit) into the dc out re-entry bushing.

6. Connect low side of test sample to a GROUND POST. (Ground lead supplied with unit may be used for this purpose.)

7. Connect alligator clip of shielded test lead to high side of test sample.

8. Increase output voltage to 500 volts (marked "500 V MEG" on Voltmeter), using RAISE VOLTAGE control to bring to desired point on scale.

9. Note reading on MEGOHMS scale, using appropriate value as described in "MULTIPLIER & OUTPUT", pg. 3.

10. Reduce RAISE VOLTAGE control back to "0".

11. To resume resistance measurement, disconnect leads from test sample and begin again at step 6.

## SPECIAL OPERATIONS

This section describes the step-by-step procedures required to perform special operations incidental to the three major functions described in the preceding section. These special operations are Overload Adjustment, Meter Recalibration and Trouble Shooting.

## OVERLOAD ADJUSTMENT

In order to perform hipot testing that meets the specific requirements of your operation, the OVERLOAD point (that amount of leakage current that will cause the FAILURE signal(s) to be tripped) must be properly adjusted.

The H300 Series Hipot Testers will test for leakage current at any desired point between approximately 50 uA (maximum sensitivity) to approximately 5.5 mA (minimum sensitivity), depending on the SENS control setting.

If ac testing is being done, do not set the SENS control to "MAX", as leakage current in most test samples will exceed 50 uA, the MAX setting, and constantly trip the FAILURE signal(s).

The OVERLOAD may be set to the desired value as follows:

1. Follow Steps 1-3 for AC or DC Hipot Testing as described in "Operation Instructions" section.
2. Set SENS control to "MIN".
3. Attach the HV test lead (supplied with unit) into the ac or dc out re-entry bushing.
4. Connect low end of resistive load to a GROUND POST. (Ground lead supplied with unit may be used for this purpose.)
5. Connect alligator clip of shielded test lead to high end of desired resistive load.
6. Increase output voltage via RAISE VOLTAGE control until desired value of trip current leakage is indicated on current meter.
7. Turn SENS control slowly towards "MAX" until the FAILURE signal trips.
8. Reduce RAISE VOLTAGE control to "0", and press RESET button.
9. Verify accuracy of OVERLOAD setting by repeating step 7, noting the reading on the current meter when the FAILURE signal trips.
10. If current meter reading matches value of desired trip current leakage, reduce RAISE VOLTAGE control to "0", press RESET button, disconnect resistive load and resume AC or DC Hipot Testing at Step 5 as described in "Operating Instructions" section.

If Current Meter reading does not match value of desired trip current leakage, reduce RAISE VOLTAGE control to "0", press RESET button, and begin again at Step 6.

NOTE: The overload circuit, in addition to sensing metered current, will also sense any leakage current that has been guarded, i.e., isolated via the GUARD POST. Therefore, precise calibration of the overload circuit is not possible in the guarded mode unless the magnitude of the guarded circuit is known.

## METER RECALIBRATION

Meters on Hipotronics H300 Series units have been calibrated with standards traceable to national standards maintained by the National Bureau of Standards in Washington, D.C., and are certified accurate to within 2% when shipped.

Meter recalibration should be performed by the user as often as necessary to meet the requirements of each particular installation, as dictated by usage and by the user's standards for accuracy. Considering these requirements, how frequently meter recalibration should be performed depends primarily on three factors: amount of physical handling, time lapse, and extent of meter usage. Intervals between meter recalibration may vary anywhere between one month and one year.

The process of meter recalibration consists of four separate operations to be performed in the sequence described:

1. Set-up Procedures
2. Voltmeter Calibration - DC
3. Voltmeter Calibration - AC
4. Current Meter Calibration

A diagram of the printed circuit board, illustrating the location of the calibration potentiometers (pots), is contained in the pocket of this publication.

## SET-UP PROCEDURES

1. If unit is cabinet-enclosed, remove from cabinet by loosening four screws on control panel and sliding out of cabinet enclosure.

2. Select a location for the unit that will place the meters at eye level to allow for maximum accuracy in readings.

3. Set RAISE VOLTAGE control to "0", and check to ensure that AC Power switch is in OFF (down) position.

4. Ground case before connecting input power. A GROUND POST on the control panel may be used for this purpose.

5. Remove dust cover that protects top and rear of unit by removing three machine screws from each side of chassis (two on top, one in rear).

6. Plug line cord of unit into 115 volt, 50/60 Hz outlet. If a two-prong adapter is used, be sure to ground the pigtail.

7. Turn AC POWER switch ON (up position). Allow at least one-half (1/2) hour warm-up time before calibrating.

8. On "B" Models, set Current Meter to "0" after warm-up, using METER ZERO control. It is suggested that the user check the current meter for "drifting" (from the zero point) before beginning calibration operations, as resetting METER ZERO later can affect accuracy of calibrations.

VOLTMETER CALIBRATION - DC

1. Ensure that unit is properly grounded and that RAISE VOLTAGE control is set to "0".

2. Set MULTIPLIER & OUTPUT control to X1 (MEGOHMS).

3. Set VOLTAGE RANGE control to LOW.

4. Select calibrated external voltmeter with meter range appropriate for unit to be calibrated.

5. Attach HV Shielded test lead into the dc out re-entry bushing.

6. Connect low side (ground) of external voltmeter to GROUND POST of unit.

7. Connect alligator clip of shielded test lead to high side of external voltmeter.

8. Increase output voltage via RAISE VOLTAGE control until external voltmeter reading is equivalent to two-thirds of LOW kilovolt scale of meter to be calibrated (unit meter).

9. Check reading on unit meter.

10. Adjust unit meter as necessary via calibration pot labeled "DC" on printed circuit board (see diagram), until unit meter reading equals reading on external meter. Use long, insulated screwdriver when calibrating to avoid contact with High Voltage leads. (High Voltage leads are connected to large transformer in rear of unit.)

11. Switch VOLTAGE RANGE control from LOW to HIGH, and check unit meter to ensure that HIGH scale reading is accurate. If unit meter reading at HIGH setting is not accurate, replace R8 resistor.

12. Reduce RAISE VOLTAGE control to "0".

VOLTMETER CALIBRATION - AC

1. Ensure that unit is properly grounded, and that RAISE VOLTAGE control is set to "0".

2. Set MULTIPLIER & OUTPUT control to 5 mA ac.

3. Set VOLTAGE RANGE control to LOW.

4. Disconnect the HV shielded test lead from the dc out and connect to ac out re-entry bushing.

5. Check connections at low side of external voltmeter, unit GROUND POST, and high side of external voltmeter.

6. Increase output voltage via RAISE VOLTAGE control until external voltmeter reading is equivalent to two-thirds of LOW kilovolt scale of unit meter.

7. Check reading on unit meter.

8. Adjust unit meter as necessary via calibration pot labeled "AC" on printed circuit board, until unit meter reading is equal to reading on external meter.

9. Switch VOLTAGE RANGE control from LOW to HIGH, and check unit meter to ensure that HIGH scale reading is accurate. If not, replace R8 resistor.

10. Reduce RAISE VOLTAGE to "0".

11. Disconnect shielded test lead from AC OUT RE-ENTRY BUSHING and GUARD, and from high side of external voltmeter.

12. Disconnect ground lead from low side of external voltmeter and unit GROUND POST.

CURRENT METER CALIBRATION

Current meters in the H300 Series are calibrated differently for units in the "A" and "B" versions. "A" units do not have calibration pots for DC/MEGOHMS readings. Accordingly, when performing meter recalibration on "A" units, skip the first set of procedures in this section and go directly to the second set of procedures, "AC Calibration."

DC CUR/MEGOIM CALIBRATION

The following procedures apply to "B" units only.

1. Ensure that unit is properly grounded, and that RAISE VOLTAGE control is set at "0".

2. If external dc current meter is available in 0-5000 uA (0-5 mA) range, select 250 k ohms, 25 W resistive load and set MULTIPLIER & OUTPUT control to X$10^4$ MICROAMPS; proceed to Step 4 in next section, "AC CUR CALIBRATION", and follow identical procedures, substituting "DC OUT RE-ENTRY BUSHING" for "AC OUT RE-ENTRY BUSHING" and equivalent MICROAMPS (uA) for MILLIAMPS (mA), e.g., 4000 uA for 4 mA.

   If external dc current meter is not available, set MULTIPLIER & OUTPUT control to X1 (MEGOHMS) and proceed to Step 3 below.

3. Set VOLTAGE RANGE control to LOW.

4. Select precision (accurate to 1%) 2 megohm resistive load for use in calibrating MEGOHM scale.

5. Attach the HV shielded test lead into the DC OUT RE-ENTRY BUSHING.

6. Connect low side of 2 megohm load to GROUND POST of unit.

7. Connect alligator clip of shielded test lead to high side of 2 megohm load.

8. Increase output voltage via RAISE VOLTAGE control to 500 V MEG indication on voltmeter.

9. Check reading on MEGOHMS scale.

10. Adjust unit meter as necessary to indicate 2 MEGOHMS. Adjust vial calibration pot labeled "DC CUR". In some units, calibration pot may be labeled "FS CAL".

11. Reduce RAISE VOLTAGE control to "0". Unit is now calibrated for all ranges of dc current and megohms.

12. Unplug shielded test lead from DC OUT RE-ENTRY BUSHING and GUARD POST and disconnect from resistive load.

13. Disconnect ground lead from resistive load and unit GROUND POST.

AC CUR CALIBRATION

1. Ensure that unit is properly grounded, and that RAISE VOLTAGE control is set to "0".

2. Set MULTIPLIER & OUTPUT control to 5 mA ac.

3. Select 250 k ohms, 25 W power rated resistive load and an external current meter with a 0-5 mA range.

4. Attach the HV shielded test lead into the AC OUT RE-ENTRY BUSHING.

5. Connect low side of external current meter to unit GROUND POST.

6. Connect alligator clip of test lead to one end of 250 k ohms resistive load.

7. Connect other end of resistive load to high side of external current meter.

8. Increase RAISE VOLTAGE control until external current meter reading is 4 mA.

9. Check reading of unit current meter on mA scale.

10. Adjust unit meter as necessary to indicate 4 mA. Adjust via calibration pot labeled "AC CUR".

11. Reduce RAISE VOLTAGE control to "0".

12. Disconnect shielded test lead from AC OUT RE-ENTRY BUSHING and GUARD POST.

## TROUBLE SHOOTING

All products shipped by Hipotronics are thoroughly tested against a rigid set of standards by the firm's Quality Control Department. In the event a unit appears not to function upon delivery, the user is referred to the section, "Returned Material".

This section of the publication is intended to aid the user in locating the source of a problem when a unit is either not functioning or functioning improperly.

Use of these procedures is at the user's own risk. It is not recommended that these procedures be used while the equipment is under Warranty, as some of the recommended steps involve the removal, testing or disconnecting of components, which could result in voiding the Warranty.

These procedures are intended for use only by a trained repair technician, and are not recommended for use by individuals trained only to operate the equipment, except under strict supervision.

An attempt has been made to provide information to aid the user in trouble shooting those problems that are most commonly encountered, either as a result of normal wear and tear or direct damage to the unit. Trouble Shooting procedures are described in tabular form on the next two pages, for ease in reference. Procedures are listed according to problem area. Possible causes of each problem are listed, along with appropriate remedial action for each case.

A flow chart summarizing the trouble-shooting process appears on Figure 3. A schematic diagram of the unit, denoting Test Points and associated voltage along with major reference points in the circuit, is contained in the pocket of this publication for reference when trouble shooting.

TABLE 1. - TROUBLE-SHOOTING GUIDE FOR H300 SERIES MODELS

| PROBLEM | POSSIBLE CAUSE | RECOMMENDED ACTION |
|---|---|---|
| NO HIGH VOLTAGE OUTPUT | A. OVERLOAD not reset<br>B. Overload relay contacts not connecting<br>C. Damage to T2 Transformer<br>D. Damage to T1 Variac (RAISE VOLTAGE control) | A. Press Reset button<br>B. Clean or replace RY1A contacts<br>C.&D. Check output of component with external voltmeter; replace if necessary |
| LOW VOLTMETER READINGS | A. Voltmeter out of adjustment<br>B. Damage to C1 capacitor<br>C. Low line voltage | A. Recalibrate voltmeter<br>B. Replace C1 capacitor<br>C. Obtain reading at power source and inform responsible authority. |
| ERRATIC HIGH VOLTAGE OUTPUT | A. Variac (RAISE VOLTAGE control) brushes dirty or worn<br>B. Overload relay contacts not connecting properly<br>C. Fluctuating line voltage | A. Clean or replace Variac brushes<br>B. Clean or replace RY1A contacts<br>C. Obtain reading at power source and inform responsible authority. |
| AC OUTPUT OK; NO DC OUTPUT | A. Faulty CR1 diode | A. Replace CR1 diode |
| ERRATIC OUTPUT CURRENT | A. Arcing from R1 Resistor<br>B. Internal arcing in T2 Transformer | A. Replace R1 Resistor<br>B. Check output current from T2 Trans.; replace if not constant |
| OVERLOAD DOES NOT TRIP | A. Bad 2D21 tube<br>B. Failure in power supply<br>C. SENS resistor value too low | A. Replace 2D21 tube. (V2 on "B" units, V1 on "A" units.)<br>B. Check voltage at Test Point 2 (TP-2) to GUARD. If power supply failure is indicated, check (in sequence) 1N4007 diode, PS8415 trans., Reset switch and 250 V dc capacitor (C2 or C4); replace where necessary.<br>C. Replace SENS resistor. |
| OVERLOAD TRIPS TOO SOON | A. SENS control set improperly<br>B. High Voltage load more than 5 mA<br>C. Leakage current to GUARD<br>D. SENS resistor value too high | A. Perform OVERLOAD Adjustment as described earlier in this publication<br>B. Limit high voltage load to maximum of 5 mA.<br>C. If Overload Adjustment was performed without consideration for leakage current connected to GUARD POST, the overload must be appropriately re-adjusted. (See NOTE in section, "Overload Adjustment".)<br>D. Replace SENS resistor. |
| RAISING VOLTAGE BLOWS FUSE (NO LOAD) | A. Damage to T1 Variac<br>B. Faulty component in HIGH VOLTAGE section | A. Check Variac and brushes for burn marks; replace if damaged.<br>B. Disconnect input to C1 capacitor and raise voltage. If fuse does not blow, check and replace faulty C1 Capacitor or CR1 diode. |

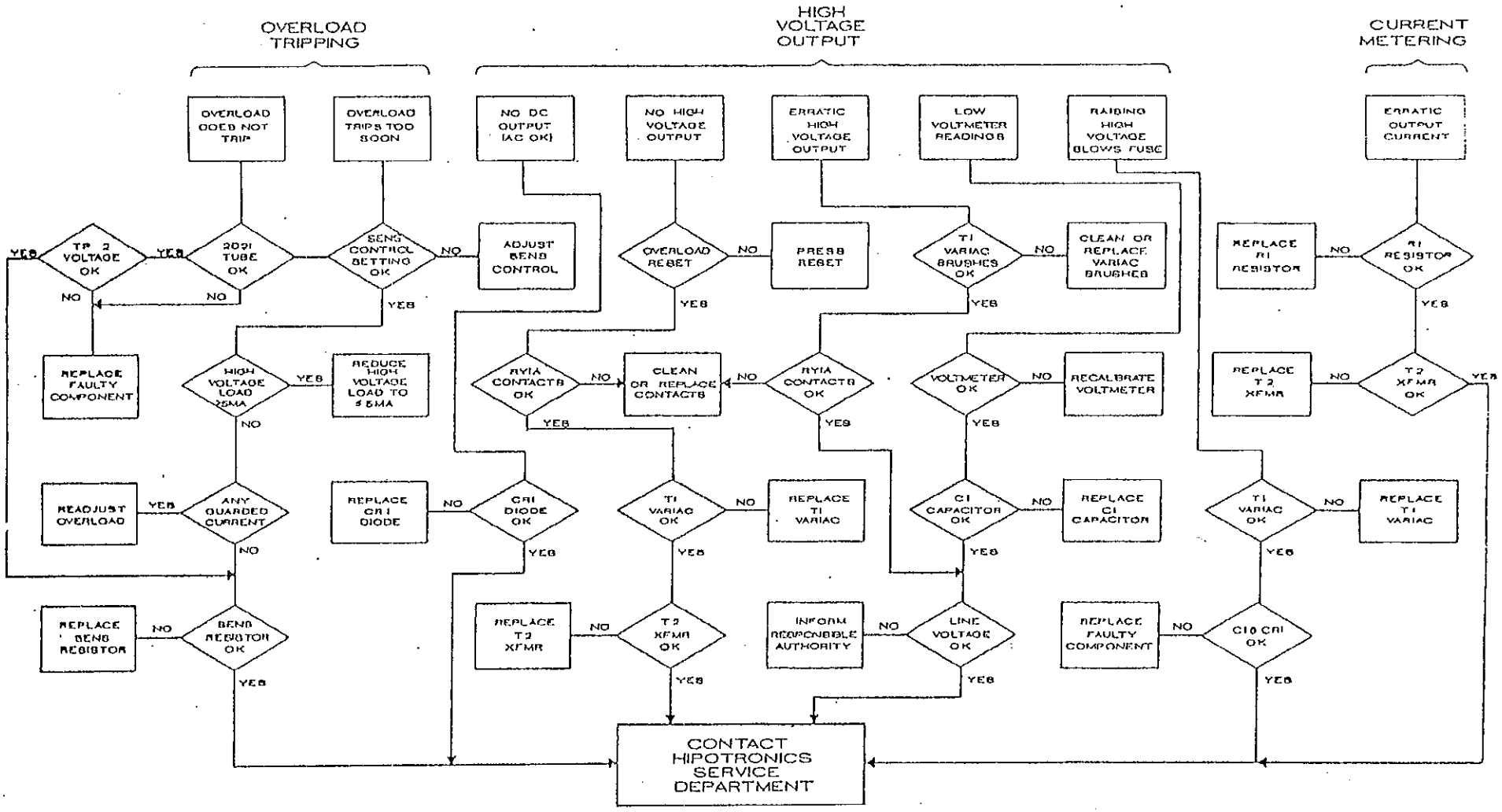


Figure 3. Trouble-Shooting Flowchart