

# ***HAPI-PLASI 2000***

## ***Helicopter Approach Path Indicator***



### **OPERATION & INSTALLATION MANUAL**

*Manual Number PLG001*

*24 September 2001*

**APPLICABLE TO**  
DA500098-3, DA500098-4, DA500099-5, DA500099-6



**DEVORE AVIATION CORPORATION**  
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**HAPI-PLASI 2000 SYSTEM HELICOPTER APPROACH PATH INDICATOR**  
**OPERATING AND INSTALLATION INSTRUCTIONS**

**SECTION I - INTRODUCTION**

1.0 Receiving Your System

Thank you for purchasing DeVore Aviation's state-of-the-art Single Box Helicopter Visual Approach Aid. Upon receipt of the HAPI-PLASI 2000 System, please inspect all containers and parts for shipping damage. Report any shipping damage to the carrier and file the required claims. Review packing slips and contents to ensure all components of the System have been received. A copy of the manufacturer's acceptance testing for the System should be included with the paperwork. Contact DeVore Aviation Corporation of America, Product Support Department, immediately if any components are missing or if you have any questions regarding the installation or operation of your HAPI-PLASI 2000 System. Use the contact numbers and addresses on the front of this manual.

1.1 Purpose

This document contains the information necessary to install and operate the HAPI-PLASI 2000 System Visual Approach Aid. The installation and operational information herein covers both the Fixed Leg Installation for Single Approach Path heliports and the HAPI-PLASI 2000 System mounted on an Automatic Rotatable Base (Turntable) for Multiple Approach Path heliports.

For maintenance and service information, refer to the Service, Maintenance & Illustrated Parts Manual.

Some installation details are left to the judgement of the installer, since local conditions, space limitations, obstructions, type of heliports, and local codes are significant factors. Local electrical codes, length of power lines, desired location of outlets, etc., are items of an individual nature which can only be described in a general way. It is the responsibility of the installer and heliport operator to ensure that all local and country codes and regulations are complied with.

1.2 Description of System

The HAPI-PLASI 2000 System, Helicopter Approach Path Indicator, is a single box, ground installed, self-contained device which, without any helicopter installed devices, projects a signal for vertical glide path information including on-glide path, high and low signals, providing obstacle clearance and reduced noise approaches. The pilot receives this information with minimum need for analysis and interpretation.



The range of the HAPI-PLASI 2000 System provides for an easy helicopter adjustment to a steady state glide path position for a desired touch down at the heliport.

### 1.2.1 Single Approach Path - Fixed Legs System

Due to prevailing winds, location and heights of buildings and other objects in the area, or for environmental considerations, there may be only one approach/ departure path for a heliport. For a Single Approach Path Installation, the HAPI-PLASI 2000 System is mounted on Fixed Legs. Each leg contains a frangible fitting designed to break away and minimize damage to an aircraft that may strike the Unit.

### 1.2.2 Multiple Approach Path - Turntable Mounted System

For heliports with Multiple Approach Paths, the HAPI-PLASI 2000 System can be mounted on an Automated Turntable. The System can be turned on and oriented to different approach paths by Radio Control from a Remote Radio Controller, by Direct Wire Control from a Control Box Unit or at the Turntable Unit itself. Radio Control of the Unit provides for the setting of three different approach paths (limited to three by Radio Controller capability), while Direct Wire Control permits the setting of up to four different approach paths with control by a Manual Rotary Switch. (**Figure 9**, System Components).

The Automated Turntable is a low profile precision tracking platform for the HAPI-PLASI 2000 System. The Turntable is driven by power from a nominal 120VAC power source, with a rotational speed of 1.3 RPM and is designed for sustained outdoor all weather operation.

The optional Radio Control System allows the approaching pilot to remotely activate the System by keying his microphone on the proper VHF radio frequency 3 times, 5 times or 7 times in a five-second interval. This action instructs the Turntable to rotate, lock on the preselected approach path and power up the HAPI-PLASI 2000 System. The HAPI-PLASI 2000 System will operate for 15 minutes, after which it will automatically "SWITCH OFF". The optional Radio Receiver Controller, which conforms to USA FAA specification L854, is a solid state Unit and designed for unattended all weather operation. **Figure 7** shows the System components for a typical installation with three approach paths.

Remote Manual Control of the Unit can be accomplished by Direct Wire Control from the tower or operations office by using the Remote Turntable Control Unit. The Remote Turntable Control Unit turns the System ON and OFF, selects MANUAL or RADIO Control, and provides a Manual Approach Path Selector Switch with up to four approach path positions.

**NOTE:** For safety, the HAPI-PLASI 2000 System SHUTS OFF while the Turntable is in transit from one heading to the next and RESTARTS when the Turntable stops at the selected heading.



The Automated Turntable contains an Integral Control Panel located in the base of the Turntable. This panel contains switches and controls which allow the setting of the approach paths and is used during the initial set up and installation. In normal operation, this panel is not used and the RADIO/OFF/MANUAL Switch should be left in the RADIO Position.

The Turntable indexing to the desired approach path is controlled by an Electronic Controller Board located within the Turntable. The controller is able to drive the Rotating Table clockwise or counterclockwise, and continuously monitors the Table position with the feedback from an encoder mounted on the Turntable motor. When power is applied to the Turntable, the Rotating Table turns clockwise until the controller detects the Zero Reference Mark. The Table then stops if no heading has been programmed into the Turntable, or moves to the selected preprogrammed heading. Selection of a specific preprogrammed heading, either by RADIO or MANUAL Control, starts the Turntable rotating in either the clockwise or counter-clockwise direction until the controller determines that the Table is aligned with the pre-set approach path. The Table direction is whichever one does not need to cross the zero reference. After the initial homing sequence, the Table will not seek the zero reference again until power is removed. The pre-set headings are stored in non-volatile memory on the Controller Board and are set to the desired direction by means of the controls located in the Turntable pedestal. The headings may be pre-set at the factory to customer request or set on site at the time of installation as described in this manual. Since the approach headings may be re-set using the controls in the Turntable Control Panel, a key lock is provided on the Control Panel door for security. Knowledge of the procedure to change headings is needed to do so, which provides additional security.

### 1.2.3 Projection Signal

From the landing pilot's view, the HAPI-PLASI 2000 System generates and projects four horizontal bands of light, only one of which can be seen by the pilot at a given instant . Both the upper and lower bands are pulsing bands created by the System's Pulse Generator System. **(Figure 1 & Figure 2)**

Above Glide Path: An upper band of green light pulsing at approximately 2.25 pulses per second is an angular wedge 2.5 degrees high by 24 degrees wide which gives above glide path indication. The apex of the projected wedge emanates from the HAPI-PLASI 2000 System.

On Glide Path: The center band is a steady green light projected as a 0.75 degree high angular wedge, by 24 degrees wide. This center band defines the correct glide path.



Slightly Below Glide Path: In between the steady green on glide path signal and the pulsing red below glide path signal is a solid red sector of 0.25 degree height by 24 degrees width. This is the slightly below glide path signal.

Below Glide Path: A lower band of pulsing red light projects a 5.0 degree vertical by 24 degrees wide wedge and provides the below glide path information.

The visual presentation is accomplished through the use of Optical Components, Moveable Shutters, a Green and Red Filter and a Tungsten Halogen Projector Lamp. The "ON/OFF" ratio of the pulsing signal is 1 to 1.

#### 1.2.4 Failsafe Systems

The HAPI-PLASI 2000 System is a "failsafe" design which ensures that any malfunction of the Beam Projection System will not result in an incorrect signal being displayed to approaching helicopters.

There are three potential failure modes of the projected signal.

The first is loss of power to the Unit or the Projector Lamp, which will result in complete loss of signal with no hazard.

The second is failure of the Pulse Generator Drive System and resulting loss of one or both pulse signals. This type of failure will be detected by Electronic Sensors (Pulse Detectors) and the Unit will SHUT DOWN, resulting in complete loss of signal with no hazard.

The third failure is if the Unit is knocked out of alignment. The Tilt Switch will be activated and will SHUT DOWN the Unit, resulting in complete loss of signal with no hazard. The Tilt Switch is pre-set at the factory on the Inclinometer Arm and requires no adjustments.

Corrective actions for the type of failures given above can be found in the HAPI-PLASI 2000 System Service, Maintenance & Illustrated Parts Manual Number PLF001, **Section IV** - Trouble Analysis Chart.

#### 1.2.5 Additional Design Features

To maximize Lamp/projection reliability, the Unit is designed with a Voltage Limiter for Lamp Voltage Control, a Photo Detector to reduce Lamp voltage for nighttime operation and a Four-Position Changer which automatically rotates a new Lamp into place upon the failure of the Lamp in use. The Unit is also equipped with heaters for cold weather operation. For more information on these features, see **Section IV**.



### 1.3 Notification to Agencies of HAPI-PLASI 2000 System Installations

Any installations of HAPI-PLASI 2000 Systems in the United States at public use heliports or helicopter landing areas on airports should be reported to the following:

National Flight Data Center  
AAT430  
Washington, D.C. 20591.

Installations should also be coordinated with the appropriate FAA Flight Standards Regional Office in the geographical areas of the planned installation.

For installations outside of the United States, the installing agent should coordinate the HAPI-PLASI 2000 System installation with their local Civil Aviation Agency.



## SECTION II - HAPI-PLASI 2000 SYSTEM LOCATION CRITERIA

### 2.0 HAPI-PLASI 2000 System Location Criteria

#### 2.1 Location of HAPI-PLASI 2000 System

The exact location of HAPI-PLASI 2000 System on the heliport site will vary depending on the type and physical layout of the heliport, the location and number of approach paths, and other variables such as adjacent structures, lighting systems, taxiways, etc.

The HAPI-PLASI 2000 System should normally be located outside of the omnidirectional perimeter lights of the helipad and in a position to minimize interference with ground maneuvering and flight operations.

Each HAPI-PLASI 2000 System installation will differ depending on site conditions but user safety and aerospace compatibility shall be prime considerations. Consult the controlling Civil Aviation Authority for any requirements regarding Helicopter Visual Approach Aids.

##### 2.1.1 Single Approach Path System - Fixed Legs

For a Single Approach Path, the HAPI-PLASI 2000 System should be permanently located in a Fixed Position at the rear half of the helipad, relative to the approach path and aligned outward into the approach path on a line parallel to the approach heading within +/- 0.5 degree.

For this type of fixed installation, the HAPI-PLASI 2000 System is mounted on frangible support legs and the legs are bolted to a concrete slab as described in **Section III**.

##### 2.1.2 Multiple Approach Path System - Turntable Mounted

For a Multiple Approach Path, the HAPI-PLASI 2000 System mounted on the Turntable should be located such that it can be readily oriented to each of the helipad approach paths and have an obstruction free path for beam projection as defined in **Paragraph 2.2** for each approach path.

To the extent possible, the System should be located in the rear half of the heliport relative to the approach paths, particularly the Primary Approach Path.

The HAPI-PLASI 2000 System is mounted to the rotating platform of the Turntable with the three threaded stud assemblies provided with the System. The Turntable is then bolted to the concrete slab as described in **Section III**.



### 2.1.3 Elevated Heliports

For elevated heliports where space limitations present a siting problem, the Unit may be located at any convenient location that does not present a hazard.

## 2.2 Determining Obstruction Clearance

A major consideration in installing the HAPI-PLASI 2000 System at a heliport site is ensuring that the approach paths on which the HAPI-PLASI 2000 System signal will be utilized are clear of obstructions. It is necessary to identify the location and height of critical objects in the approach path by necessary surveys, or from local authorities (**Figure 2**).

With all the obstructions identified within the 24 degrees wide beam spread, plot the approach path on a profile map. A line should be drawn from the proposed location of the HAPI-PLASI 2000 System at an angle to clear the highest obstacle by not less than 1.4 degrees\*. This line will then establish:

- (a) An obstruction clear surface 12 degrees on both sides of the approach path centerline and extending outward into the "Heliport Approach Surface".
- (b) The minimum aiming angle of the HAPI-PLASI 2000 System.

If the HAPI-PLASI 2000 System is to be installed on a Turntable for multiple approach paths, this obstruction clearance analysis should be accomplished for all of the approach paths utilized by the System.

\*1.4 degrees has been determined from half the angle of the on course signal plus 1 degree.

## 2.3 Glide Path Angle

The visual glide path angle for helicopters is normally set at 6 degrees, or the angle specified by the heliport operator. This angle may be increased up to 12 degrees maximum to provide an obstruction clear surface, if so determined per **Paragraph 2.2**.

The commissioned angle should be specified in a NOTAM and also published in the Airmans Information Manual for installations in the USA. For installations in other countries, contact the appropriate regulating authority for civil heliports.

The HAPI-PLASI 2000 System can be adjusted for approach angles from one (1) to twelve (12) degrees.



## 2.4 Angular Alignment

The HAPI-PLASI 2000 System shall be aligned outward into the approach path on a line parallel to the approach path centerline within a tolerance of +/- 0.5 degree for approaches where no obstacle clearance problems exist.

If obstructions intrude into the HAPI-PLASI 2000 System beam near the outer edge of the beam, then it is permissible to offset the HAPI-PLASI 2000 System up to +/- 3 degree to provide lateral obstacle clearance.

## 2.5 Aiming

The HAPI-PLASI 2000 System should be aimed at the desired glide path angle and should be set to within plus or minus three minutes of the established vertical aiming angle. Reference installation details in **Paragraph 3.5**.

Aiming angle can be increased up to a maximum of 12 degrees if required to clear obstructions per **Figure 2**.



## SECTION III - INSTALLATION

### 3.0 HAPI-PLASI 2000 System Installation

#### 3.1 Electrical Requirements

##### 3.1.1 Power

Wire diagram **Figure 6a** shows 120VAC, 120VNeutral

The HAPI-PLASI 2000 System is placarded for 120 VAC, 50 or 60 Hz and a maximum required power of 1.4 KW. The actual continuous daytime power required is 1110 watts, and the night time required power is 811 watts. The use of the Turntable does not increase the power required, since the HAPI-PLASI 2000 System turns off while the Turntable rotates into position.

The Unit must be supplied with a nominal 120 volts  $\pm 10\%$ , 50 or 60 Hz, single phase alternating current. If an increase in voltage is required at the Unit to meet the nominal voltage, a buck-boost transformer may be installed in the power line to increase voltage by up to 25%.

##### 3.1.2 Wire Size

**Figure 3a** and **Figure 3b** provide recommended wire sizes for 120 volt or 240 volt power sources for various run distances. All wire sizes should be compatible with power transmission and voltage drop requirements.

To reduce wire size, higher voltages may be utilized, and then a step-down transformer installed at the HAPI-PLASI 2000 System site to reduce voltage to the required nominal 120 VAC  $\pm 10\%$ .

##### 3.1.3 Electrical Connections

This paragraph is to be performed after the HAPI-PLASI 2000 System is installed on its support pad.

**NOTE:** If required by local codes, a "breakaway" type plug and receptacle connector may be installed. The installation should be at the ground exit point of the main power cable near the Unit. Connectors shall conform to FAA Advisory Circular AC150/534526, Specification for L823 Plug and Receptacle, Cable Connectors. (See FAA Advisory Circular AC150/53451 for listing of approved connectors).

##### 3.1.3.1 Fixed Leg Installation

The power, neutral and ground wires are routed up through the service feed-through in the Base Plate. The power (120VAC) and neutral leads are electrically connected to their respective studs as identified on the Terminal Block. The



ground lead is secured to the ground stud just forward of the Terminal Block.  
**(Figure 13)**

All internal components are grounded to the HAPI-PLASI 2000 System Base Plate. For proper safety, a ground lead must be attached internally to the ground stud. If a ground lead is not routed with the incoming power lines a local ground rod may be used to provide the Unit with a proper ground.

### 3.1.3.2 Turntable Installation

The Turntable System is provided with a 9 ft. power cable P/N DA2602-1. This is a three conductor cable with the Turntable mating connector on one end.

Connect the cable to the incoming power as follows:

CABLE DA2602-1	INCOMING POWER LINES
BLACK CONDUCTOR	120VAC
RED CONDUCTOR	120V NEUTRAL
BLUE CONDUCTOR	GROUND

If an incoming ground lead is not routed with the incoming power lines, a local ground rod may be used to provide the Unit with a proper ground.

## 3.2 Support Pad

If the helipad or an adjacent structure meets the minimum requirement, it may be used as the support pad.

### 3.2.1 Location

The exact location for the HAPI-PLASI 2000 System support pad should be determined per **Section II** and should be designed for stability based on local soil and weather conditions.

### 3.2.2 Construction

The generally accepted support pad for most conditions where permafrost is not a problem is a concrete slab 6 to 8 inches thick and extending a minimum of 12 inches (30 cm) outside the HAPI-PLASI 2000 System housing. The 12 inch (30 cm) extension is to provide a margin of protection from moving vehicles. Attach hardware should be imbedded in the slab as required per **Paragraph 3.2.3**.

Where permafrost is a concern, integral piers extending two feet below the permafrost line should be used to stabilize the 6 to 8 inch thick concrete slab.



Reference **Figure 7**, DeVore Drawing 500099 and **Figure 8**, DeVore Drawing DA500098 for details.

### 3.2.3 Attachment Hardware

The positioning of the attach hardware into the concrete is critical. Reference **Section II** for the correct horizontal angular alignment (**Paragraph 2.4**).

If an existing structure is to be used, the HAPI-PLASI 2000 System Fixed Leg and Turntable Mounted Systems must be attached to the existing structure with an Equivalent Retention System as described below.

The Fixed Leg System requires four (4) "L" or "J" support studs per leg embedded about 4 inches (10 cm) into the concrete slab at the time the slab is poured. (**See Figure 8.**) Another method of attachment would be to position the Unit on its legs as desired, drill holes in the concrete and insert anchor bolts.

The Turntable Mounted System requires three (3) "L" or "J" support studs embedded about 4 inches (10 cm) into the concrete slab at the time the slab is poured. (**See Figure 9.**) The Turntable should first be indexed as described in **Paragraph 3.4** for all approach paths. The hardware should then be located in the concrete slab with the Turntable Mounted System set to and aiming along approach path 1. The Turntable can also be secured by positioning the Turntable as desired, drilling holes in the concrete and inserting threaded anchor studs. Approximately 3 - 4 inches (75 - 100 mm) of threaded rod is needed for adjustment and locking nuts above and below the Turntable Base.

## 3.3 Mounting

### 3.3.1 Fixed Leg System

The HAPI-PLASI 2000 System is attached to the concrete slab by three support legs, as shown in **Figure 7**. Each leg contains a frangible fitting designed to break away and minimize damage to any aircraft that may accidentally strike the Unit.

**NOTE:** Legs shown in **Figure 7** are for standard environmental (average) conditions. If additional leg height is required, due to more critical terrain or snow conditions, longer legs can be supplied upon request. The installer may cut leg extensions locally from standard 2-inch diameter electrical metal tubing (EMT).

1. Place the mounting flange of each support leg over the pre-installed support studs or position the legs as desired, drill holes in concrete and insert anchor bolts.
2. Install attach hardware and tighten all nuts to secure the legs.
3. Remove the top nut and washer (one of three) from each support leg.



4. Reposition the remaining two nuts on each support leg mid way along the leg's threaded section.
5. Carefully set the HAPI-PLASI 2000 System on the support legs inserting the threaded section of each leg through the appropriate holes in the Unit's Base.
6. Install washers and nuts on the support studs. Hand tighten only.
7. The Unit is now in position for final aiming adjustment as described in **Paragraph 3.5.**

### 3.3.2 Turntable System

The HAPI-PLASI 2000 System mounted on a Turntable is attached to the concrete slab with the three attach holes in the Base of the Turntable as shown in **Figure 8.**

1. Determine the location where the HAPI-PLASI 2000 System will be installed at the heliport site as per instructions contained in **Section II.**

**CAUTION: THE ZERO INDEX OF THE TURNTABLE IS APPROXIMATELY ALIGNED WITH DOOR SIDE OF THE TRIANGULAR BASE OF THE TURNTABLE. BE SURE THAT NONE OF THE DESIRED APPROACH HEADINGS ARE WITHIN +/- 5.0 DEGREES OF THE ZERO INDEX WHEN POSITIONING AND ATTACHING THE TURNTABLE. SEE PARAGRAPH 3.4 INDEXING.**

2. Provide electrical power to the selected site as outlined in **Paragraph 3.1, Electrical Requirements.**
3. Install and secure the HAPI-PLASI 2000 System threaded Leg Assemblies to the Turntable.
4. Install the HAPI-PLASI 2000 System on the threaded Turntable Leg Assemblies.
5. If the Turntable was not indexed at the factory, program the approach paths into the Turntable in accordance with **Paragraph 3.4, Indexing.**
6. Set the Turntable to approach path 1 and bolt it to the support pad.

**CAUTION: LIFT THE HAPI-PLASI/TURNTABLE SYSTEM BY THE TURNTABLE TABLE OR BASE AND NOT BY THE HAPI-PLASI 2000 SYSTEM ITSELF.**

7. Level the Turntable. Ensure when leveling the System that the bubbles are centered in both Turntable bubble levels for each of the approach directions



with the Unit set and locked at the approach angle selected. Reference **Paragraph 3.4(6)**.

8. Aim and level the HAPI-PLASI 2000 System per instructions in **Paragraph 3.5**.
9. Provide a nominal 120V +/-10% power to the selected site and wire power to the Turntable in accordance with **Paragraph 3.1**.
10. Connect the cable between the Turntable and the HAPI-PLASI 2000 System, (Cable Part Number DA500946-1).
11. Apply electrical power to the System and accomplish a complete operational check of the System as follows:

- A) In HAPI-PLASI 2000 System, set Circuit Breaker to "ON"; and the Control Selector Switch to "REMOTE" position (switches are inside HAPI-PLASI 2000 System, **Figure 14** ).
- B) In the Manual Control Unit (P/N DA 1760-5), turn the Switch to the "ON" Position. Power indicator lights will illuminate and HAPI-PLASI 2000 System will TURN ON (Turntable must be stopped at one of the approach headings for HAPI-PLASI 2000 System to TURN ON).

For HAPI-PLASI 2000 Systems without Radio Control or the Manual Control Unit, control the System using the Turntable Control Panel.

- C) Rotate the "Approach Path" Switch (Rotary Switch) to one of the headings preset into the Turntable. The Turntable will rotate and stop at the pre-programmed headings. Note that the HAPI-PLASI 2000 System shuts off while Turntable is in transit from one heading to the next and restarts when Turntable stops at selected heading. Select each pre-programmed heading in turn using the Rotary Switch to check that the headings are correct.
- D) Turn the Select Switch to RADIO CONTROL. The HAPI-PLASI 2000 System will TURN OFF. TURN ON the FAAL854 Radio Receiver Controller. (Complete operational instructions for the Radio Receiver Controller are contained in the Field Service Instructions booklet provided with the Unit). Depress test button three times within five seconds. HAPI-PLASI 2000 System should TURN ON, rotate and stop at the Number 1 pre-set heading. Depress test button five times within five seconds. HAPI-PLASI 2000 System should rotate and stop at the Number 2 pre-set heading. Depress test button seven times within five seconds. HAPI-PLASI System should rotate and stop at the Number 3 pre-set heading. The HAPI-PLASI 2000 System will remain on for fifteen minutes, after which the Radio Receiver Controller will time out and TURN OFF the HAPI-PLASI 2000 System.



The above procedures accomplish a complete operational check of the System. Leave the Radio Receiver Controller Power Switch in the "ON" Position for REMOTE operation by Radio Control.

**WARNING: TEMPORARILY DISCONNECT THE MAIN ELECTRICAL POWER SOURCE BEFORE OPENING THE SYSTEM.**

12. At the MANUAL/RADIO Control Unit, TURN OFF the power switches to SHUT OFF the Systems.
13. Install the FAAL854 Radio Receiver Controller at a convenient location (if utilized). Permanently install the Manual/Radio Control Unit at its selected location, i.e., control tower, operations office, or at heliport site. Install permanent cables (not provided with the System) in place of the removed cables.
14. After permanently installing all equipment and interconnect wiring, reconnect the main electrical power source to the System.
15. Turn the System on at the Main Power Switch and again complete an operational check of the System.
16. After satisfactory completion of System tests, the Unit is ready for operational use.
17. System usage:

For Systems with Radio Control and Remote Manual Control.

A. Remote Manual Control of System.

- 1) Turn "Approach Path" Switch (Rotary Switch) to the desired approach heading. The Turntable and HAPI-PLASI 2000 System will rotate and stop at the selected heading.
- 2) When power is not interrupted and another approach direction is selected, the HAPI-PLASI 2000 System will turn directly to the new heading. Remember, the Unit does not operate while the Turntable is in transit.

NOTE: Every time the Turntable is powered up, it will always turn clockwise to the Zero Index Mark first to establish its orientation.

B. Radio Control of System.

- 1) With the System turned ON and set for RADIO CONTROL, operate the System in accordance with 11D of this paragraph.



### 3.4 Indexing Procedure

**NOTE:** If the HAPI-PLASI 2000 System approach headings have been preset at the factory, the indexing procedure is not required and the Turntable should be installed per **Paragraph 3.3**, HAPI-PLASI 2000 System and Powered Turntable Installation Procedure.

Programming the HAPI-PLASI 2000 System Preset Headings to provide Turntable Indexing:

1. Determine the location where the HAPI-PLASI 2000 System will be installed at the heliport site as per instructions contained in **Section II**.
2. Provide a nominal 120VAC electrical power to the selected site and temporarily wire power to the Turntable so that the powered Turntable may be operated.
3. Temporarily hook up electrical power connections from the powered Turntable to the power source per **Paragraph 3.1**.

**NOTE:** Components are shipped with temporary interconnect cables and connectors for initial checkout of the System. Permanent cables are installed after System components have been permanently installed.

4. At the Control Panel in the Turntable itself, place the RADIO/OFF/MANUAL Switch to "MANUAL", place the Position Switch to Position "1" and then place the "ON/OFF" Power Switch to "ON". The Table will rotate clockwise for less than one complete revolution and then stop. If the Turntable has already had a heading programmed into Position 1, the Table will immediately turn counterclockwise to that heading.
5. In order to program a new heading for Position 1, press the "SET POSITION" pushbutton. The green light above the pushbutton will illuminate, indicating that the Turntable is in programming mode.

**NOTE:** The light will go out and the Turntable will return to normal operation in 2 minutes unless the Table position is jogged. Jog the Table position with the "ROTATE CCW/CW" Switch until the Table is aligned with the desired heading. Recheck to make sure that the Position Switch is set to Position 1 then, with a screwdriver or other similar object, push the button behind the hole marked "MEMORIZE POSITION". The green light will go out and the Turntable will now be programmed with the new Position 1 heading. Set Positions 2 through 4 the same way, but with the Position Switch set to the corresponding number. Since Position 1 requires only 3 clicks on the Radio Controller, it should be set to the most used approach path heading. Remember that Position 4 cannot be selected by radio control, only manually.



6. After positioning, and before permanently securing the Turntable, it is necessary to ensure that the Turntable is completely level. This is accomplished by adjusting the support and locking nuts on the mounting threaded rods/bolts on the Turntable base at its mounting points.  
  
NOTE: If the Base is not level, inadvertent shutdown of the HAPI-PLASI 2000 System can occur due to activation of its safety Tilt Switch when the Table rotates.
7. At the Control Panel in the Turntable itself, place the RADIO/OFF/MANUAL Switch to "RADIO" .
8. If the remote Manual/Radio Control Option and/or Radio Controller Option have been ordered with the System, then connect the control box to the Turntable and the Radio Controller to the Control Box. The multi-pin connectors will only fit into the proper corresponding connectors.
9. Reconnect electrical power to the System, if it has been disconnected. At the Remote Control Box, rotate the Rotary Switch to each of the preset approach headings in turn. The Turntable will rotate and stop at each of the selected headings. Turn electrical power off.  
  
NOTE: The HAPI-PLASI 2000 System shuts off while Turntable is in transit from one heading to the next and restarts when the Turntable stops at the selected heading.
10. Selector Switch positions may be arranged to suit specific installations as described above. The radio controller allows the pilot to remotely turn on the HAPI-PLASI 2000 System and line it up with any of the three pre-set approach paths by keying his microphone within five seconds on the selected radio frequency. Three "clicks" of the microphone within five seconds will index the Turntable to approach path 1 (heading no. 1). Five "clicks" will index the Turntable to approach path 2 (heading no. 2). Seven "clicks" will index the Turntable to approach path 3 (heading no. 3).

### 3.5 Aiming

#### 3.5.1 Lateral Leveling of HAPI-PLASI 2000 System on the Turntable

1. Remove outer shell.
2. Locate horizontal level between the two Webs.
3. Adjust the nuts on the two front support legs (**Point A in Figure 10**) until the Unit is level. Make certain that the spacers of the HAPI-PLASI 2000 System are resting on the lower adjusting nuts.
4. Tighten the two lower jam nuts on both front legs. Lightly tighten the upper nuts.



5. Unit is ready for vertical aiming.

### 3.5.2 Vertical Aiming

1. On the Level Arm Tilt Switch Assembly located on the inside of the Unit, set the Zero Index Mark to the desired approach angle on the degree scale (**Point C in Figure 11**) by loosening the Level Arm clamp bolt and moving the Level Arm Assembly.
2. Re-tighten the clamp bolt.
3. Adjust the vertical angle by adjusting the nuts on the rear support stud (**Point B in Figure 10**) until the bubble in the beam level (**Point D in Figure 11**) is centered.
4. Tighten the two lower jam nuts.
5. Tighten the upper nuts on each of the three support legs to 50 (plus or minus 10) inch pounds torque.
6. Recheck the horizontal and lateral bubble levels. Readjust, if required.
7. On HAPI-PLASI 2000 System models, a Vernier Scale System has been incorporated into the Level Arm/Tilt Switch Assembly to permit finer settings of the approach angle. The Level Arm contains a Vernier Scale which is graduated into .020 degree increments, which permits angular settings as small as 1.2 minutes accuracy (**see Figure 12**). The Main Scale is divided into .2 degree increments. Therefore, if the Zero Degree markings on the sliding Vernier is used as the Index Mark, the degree settings can be set to .2 of a degree. For finer settings to an accuracy of .020 degree (1.2 minutes), the Vernier Scale is utilized.
8. When utilizing the Vernier in a measuring position where the Zero Degree Mark on the sliding Vernier Scale is not exactly in line with a Division Line on the Main Degree Scale, the graduation value just preceding the Zero Degree Mark must be supplemented with the value of the Vernier indications. This latter value is displayed as the number of that single Vernier line, which exactly coincides with the graduation line on the scale. In the **Figure 10** illustration, that line of the Vernier is the seventh division (as indicated by starred area), resulting in a combined indication value of 7.68 degrees (7 degrees plus 0.6 degree, plus four .020 degree graduations, or .08 degree, giving a total of 7.68 degrees).
9. If it is necessary to set an approach angle of between 10 degrees and 12 degrees, then the upper portion of the Vernier Scale is used for the measurement (**Figure 11**). In this case, then the Upper 10 Division Mark is used as the Zero Index Mark and the readings are measured from the Upper 10 Division Mark to the Zero Degree Mark.



### 3.5.3 Checking Accuracy of HAPI-PLASI 2000 System Projection

Experience has shown that the PLASI 2000, HELI-PLASI 2000 and, therefore, HAPI-PLASI 2000 Systems does not have to be flight checked. The HAPI-PLASI 2000 System is a Single Box System which maintains its approach angle and the various flight sectors (flashing green, steady green, etc.) are mechanically locked in place.

In Multiple Box Systems, the approach sectors are dependent upon the relationship of one box with respect to the other boxes, any one of which can move, thereby modifying the signal. While the Tilt Switch is a controlling factor with regard to the operation of the HAPI-PLASI 2000 System and limits the movement of the System to the Tilt Switch settings, there is another more important check on the approach angle which should be made. Ensure when leveling the System that the bubble is centered for each of the approach directions with the Unit set and locked at the approach angle selected. Since the sectors are automatically set in the HAPI-PLASI 2000 System and are not dependent on their relation to another box, it is only necessary to check that the bubble is centered for the approach angle established. This can be checked periodically on the HAPI-PLASI 2000 System by checking during Lamp changes or at any time the Unit is inspected.

Nevertheless, the appropriate controlling Civil Aviation Agency may require some type of flight check.

### 3.6 Operational Check and Final Adjustment

#### 3.6.1 Lamp Installation

**CAUTION: WHEN OPENING SOCKET, DO NOT ALLOW CLAMP TO SNAP CLOSED.**

1. Open socket.

**CAUTION: WHEN HANDLING LAMPS, DO NOT TOUCH GLASS SURFACE. BODY CHEMICALS CAUSE GLASS LAMP ENVELOPE TO BECOME OPAQUE. HANDLE WITH CLEAN CLOTH OR GLOVES. IF TOUCHED, CLEAN GLASS WITH ALCOHOL OR SIMILAR CLEANING AGENT.**

2. Install new BVA (900W, 120V) Lamps. Pull Socket lever closed to secure.

3. Reset Lamp Table by rotating Table clockwise until Number 1 Lamp is in the Operating Position.

#### 3.6.2 Inspection

1. Inspect the HAPI-PLASI 2000 System supports to ensure that they are installed in accordance with the drawing and that all mounting bolts are tight.



2. Check electrical connections to ensure that they are tight and correct.
3. Inspect optical surfaces for cleanliness. The front window is subject to soil from external sources. Clean optical surfaces with standard glass cleaning solutions and dust with lint free tissues or cloth.
4. Check that Lamps are properly installed (*see Paragraph 3.6.1*) and that Number 1 Lamp is in Operating Position.

### 3.6.3 Operation

1. Pull the 10 amp circuit breaker to its "OFF/OPEN" Position. (*Figure 14*)
2. Turn "ON/OFF/REMOTE" Switch to the "OFF" Position in HAPI-PLASI 2000 System. (*Figure 14*)
3. Apply the main power to the Unit by closing the Switch controlling power at the basic power source for the HAPI-PLASI 2000 System.
4. Check line voltage at HAPI-PLASI 2000 System to ensure correct voltage is being applied to the Unit. Test across 120VAC (Red) and Neutral (Black). (*Figure 13*)
5. If voltage is correct (120VAC +/-10%), close the circuit breaker.
6. Place the "ON/OFF/REMOTE" Switch in the desired position. Switch shall be in "ON" Position for direct ON/OFF control at the HAPI-PLASI 2000 System, or in "REMOTE" Position if HAPI-PLASI 2000 System is being controlled by Remote Wire or Radio Control.
7. Select desired daytime Lamp voltage at the Voltage Limiter, either 100 volts (long Lamp life setting) or 108 volts (higher intensity for longer day time range).
8. If night dimming intensity requires adjustment, go to **Section IV**.
9. Replace the outer shell.

### 3.7 HAPI-PLASI 2000 System Operational Controls

Operational control requirements for HAPI-PLASI 2000 System vary depending upon the manner in which the heliport desires to use the Unit. The location of the Radio Receiver Controller and Manual Control Unit is optional. They may be located adjacent to the HAPI-PLASI 2000 System or at some alternate convenient location. The Manual Control Unit will normally be installed in the control tower or operations office. If these are located more than 100 meters from the HAPI-PLASI 2000 System, the extended control cable modification option must be ordered.



### 3.7.1 Manual Control

For continuous 24 hour operation, manual "ON/OFF" control of the HAPI-PLASI 2000 System is provided directly at the Unit by means of a Selector Switch. The HAPI-PLASI 2000 System "ON/OFF/REMOTE" Control Select Switch shall be in the "ON" position for this type of ON/OFF control. The night dimming feature is automatic.

### 3.7.2 Remote Manual Control

Manual Remote Control of HAPI-PLASI 2000 System "ON/OFF" function by Direct Wire or by Radio Remote Control is available as an add on option.

Remote "ON/OFF" control of HAPI-PLASI 2000 System by Direct Wire can be accomplished by means of the Remote Control Box for operational control from an airport tower or operations office.

With the Manual Remote System wired into the HAPI-PLASI 2000 System control circuitry, the "ON/OFF/REMOTE" Control Select Switch must be placed in the "REMOTE" position.

Circuit wiring connections are shown in the HAPI-PLASI 2000 System wiring diagram. (**Figures 6a and 6b**)

### 3.7.3 Remote Radio Control

For Turntable mounted Systems, control of both the HAPI-PLASI 2000 System "ON/OFF" function and rotation of the base may be controlled remotely by either a Remote Wire Control System or by Radio Control. See **Paragraph 1.2.2** for details.

For Systems so equipped, Radio Remote "ON/OFF" control of the Rotatable Base and/or HAPI-PLASI 2000 System can be accomplished using the FAA-L-854 Receiver/Decoder wired into the Rotatable Base and HAPI-PLASI 2000 System Control Circuit. The "RADIO/OFF/MANUAL" Control Select Switch shall be in the "RADIO" position for control by radio. Radio control by keying a transmitter can be accomplished from a tower, operations office, or from a helicopter, and provides control functions and a fifteen (15) minute operational cycle.



## SECTION IV - FEATURES

### 4.0 HAPI-PLASI 2000 System Standard Features

#### 4.1 Voltage Limiter

The "Voltage Limiter II", Part Number DA1293-1, provides the Projector Lamp in use with a daytime stabilized voltage of 100 volts or 108 volts. The heliport operator selects the 100 volt or 108 volt setting at the time of installation. The selection is made by switching a small Toggle Switch located inside the HAPI-PLASI 2000 System on the top left hand side of the Voltage Limiter. (**Figure 4**)

The 100 volt setting would be used at a heliport with a short final approach (under two miles). The 100 volt setting will more than double Lamp life. If this lower setting is selected, a flight evaluation should be conducted under sunny conditions to ensure that the HAPI-PLASI 2000 System signal is still adequate in range for the particular heliport approach conditions.

The Voltage Limiter also provides for adjustment of the System's night dimming intensity. See **Paragraph 4.2**, Automatic Night Dimming.

#### 4.2 Automatic Night Dimming

The HAPI-PLASI 2000 System is equipped with a Photo Sensor to provide automatic dimming for night time operation. The Photo Sensor is mounted in the Base Plate facing down at about the center of the Unit.

The night voltage has been preset at the factory. If local conditions dictate an increase or decrease in night intensity, the Lamp voltage may be adjusted at the Voltage Limiter (**Figure 4 and Figure 5**). Sufficient approaches should be flown at night to determine the proper night voltage setting for local environment.

**NOTE:** Daytime Lamp voltage may be checked at "Lamp" test point, but daytime Lamp voltage is not adjustable, only selectable between 100 volts and 108 volts.

Adjustment:

1. Locate the potentiometer R116 on the Voltage Limiter, **Figure 4**.
2. Trigger the Photocell to night operation by covering the Photocell Unit. The Photocell is time delayed, therefore, it will take 45 to 75 seconds for the Unit to trigger down.
3. Place a set of voltmeter test leads across the red (TPJ-3) and the white (TPJ-2) test points on the "Voltage Limiter II" Unit (**Figure 4**).



4. Adjust the R116 potentiometer to the desired voltage or Lamp brightness. Do not adjust below 48 Vrms.
5. Remove cover from the Photocell.

#### 4.3 Tilt Switch

If the Unit is knocked out of alignment the Tilt Switch is activated and shuts down the Unit. This results in complete loss of signal with no hazard. The Tilt Switch is pre-set at the factory and requires no adjustments.

#### 4.4 Pulse Detector

As part of the failsafe System, the HAPI-PLASI 2000 System is equipped with Pulse Detectors which monitor the signal generating shutter chains. If the upper or lower shutter chain fails, the HAPI-PLASI 2000 System shuts down.

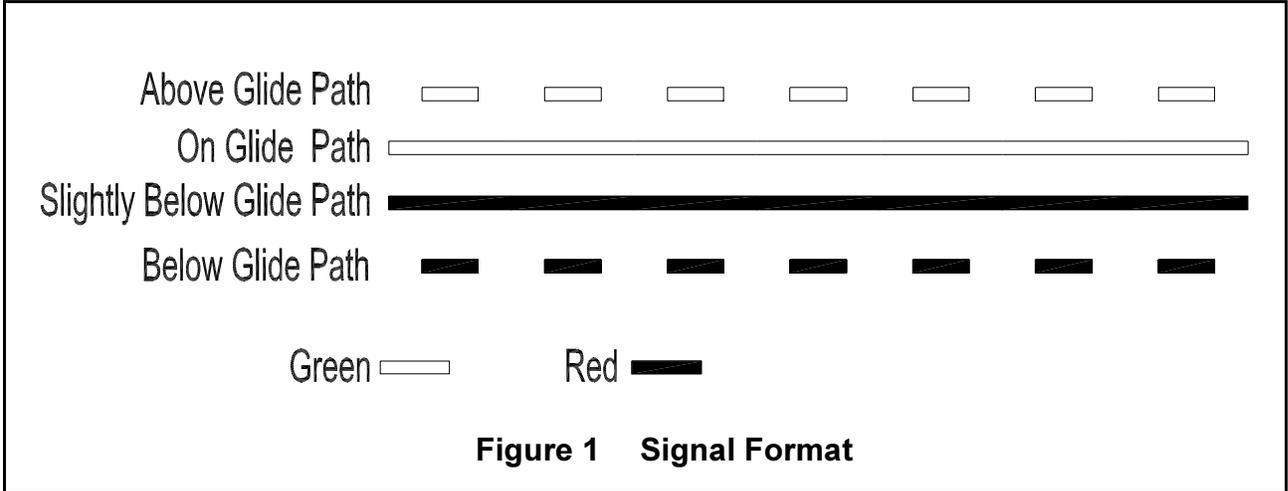
#### 4.5 Automatic Lamp Changer

The Automatic Lamp Changer rotates the Lamp Table and a new Lamp into place in approximately two seconds, if the one in use should fail. The Lamp Table holds four Lamps.

#### 4.6 Heaters

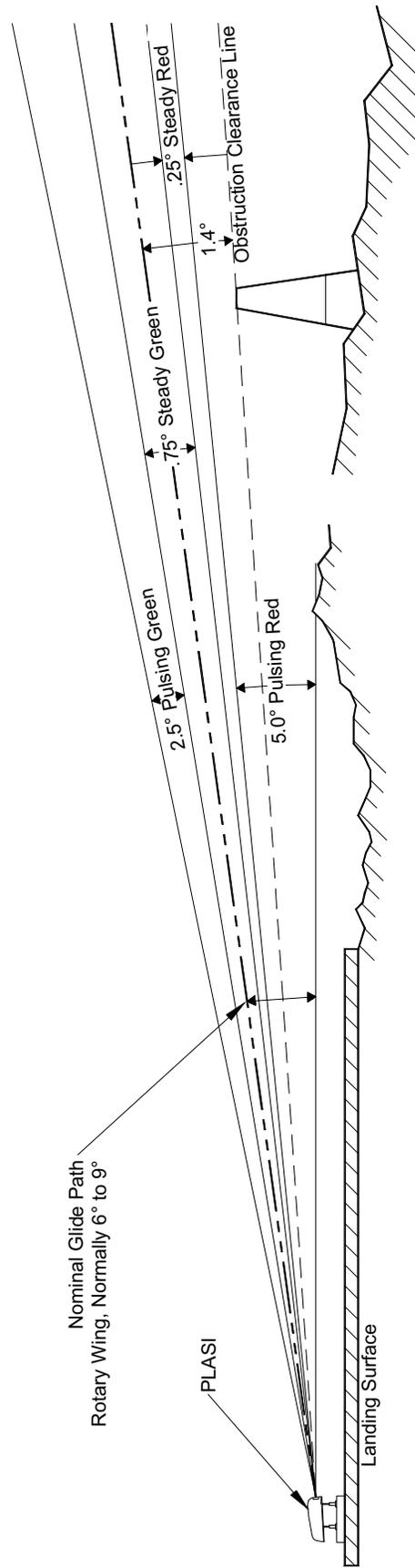
The Heaters, which consist primarily of six 35 watt heaters installed inside of the HAPI-PLASI 2000 System (**Figure 15**), maintain components of the HAPI-PLASI 2000 System at operating temperatures during periods when the HAPI-PLASI 2000 System is used only intermittently, and when ambient temperatures are near or below freezing levels. This permits the HAPI-PLASI 2000 System to operate immediately upon "TURN ON" by Remote Control signal and eliminates any need for a "WARM-UP" period for the Unit. When ambient temperatures inside the HAPI-PLASI 2000 System are above 45°F, the Heating System is not required and the Control Module TURNS OFF the heaters. When the temperature drops to below 45° F, the Heating System will again operate.





**Signal (Beam) Angle**

- Width 24° minimum
- Height Above course single pulsing green light 2.5°
- On course signal steady green light .75°
- Slightly below course signal steady red light .25°
- Below course signal pulsing red light 5.0°



Minimum obstruction clearance angle of 1.4 degrees includes 1.0 degrees from the bottom of the on course green sector.

**Figure 2 HAPI-PLASI 2000 System Signal Projection (Heliports)**



Example:  
 Power Vault (Source) to PLASI 1000 feet  
 2 AWG Wire is required without B/B transformer  
 10 AWG Wire may be used with B/B transformer

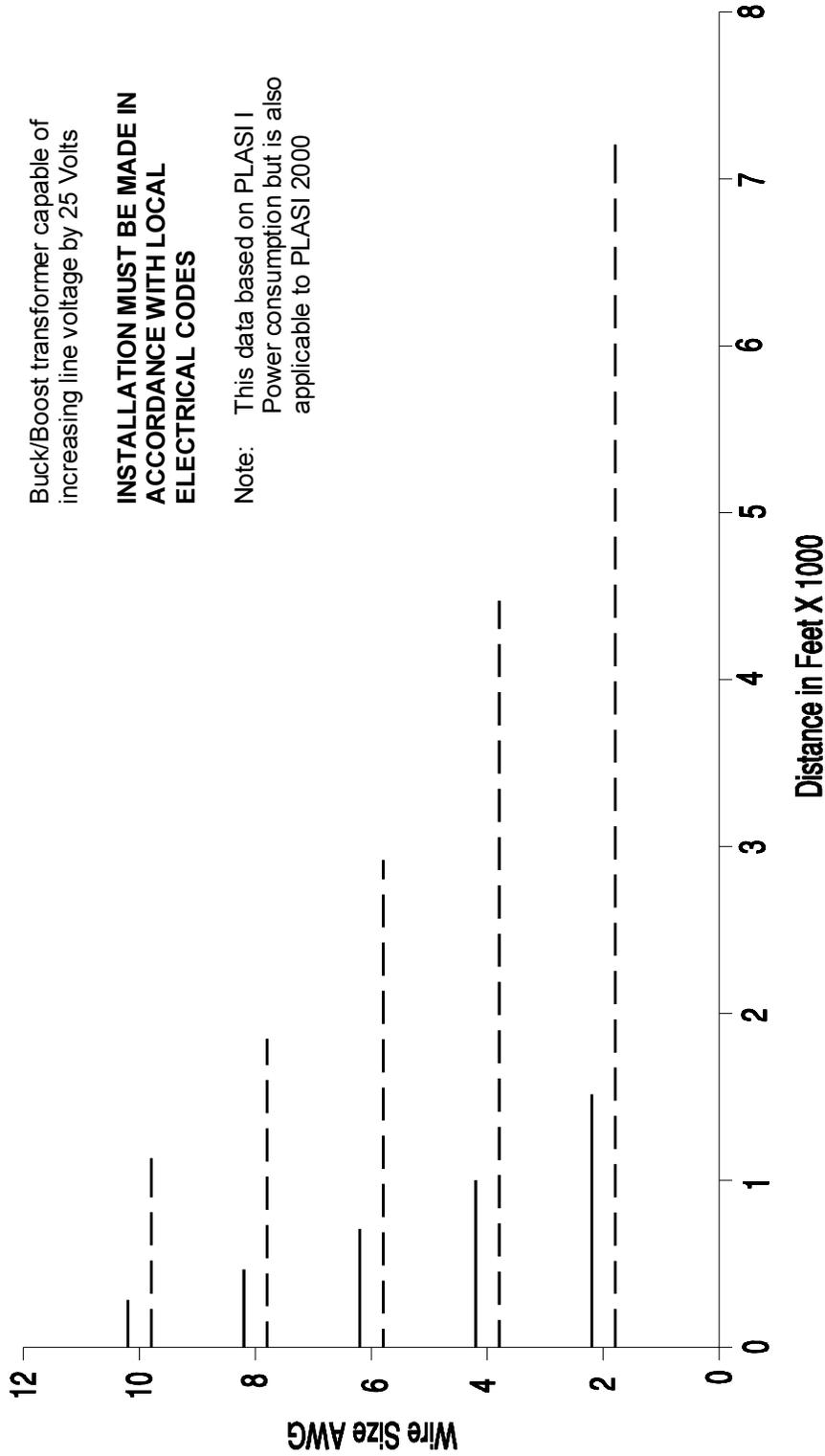
Chart based on:

1600 Watts  
 13.3 Amps @ 120 Volts  
 Voltage drop at regulator 5% of line nominal

Buck/Boost transformer capable of increasing line voltage by 25 Volts

**INSTALLATION MUST BE MADE IN ACCORDANCE WITH LOCAL ELECTRICAL CODES**

Note: This data based on PLASI I Power consumption but is also applicable to PLASI 2000



— From 120 Volt Source  
 - - - From 120 Volt Source with Buck/Boost Transformer

Figure 3a HAPI-PLASI 2000 System Electrical Installation Recommended Wire Size from 120 VAC Source



Example:  
 Power Vault (Source) to PLASI 1000 feet  
 2 AWG Wire is required without B/B transformer  
 10 AWG Wire may be used with B/B transformer

Chart based on:  
 1600 Watts  
 6.7 Amps @ 240 Volts  
 Voltage drop at regulator 5% of line nominal

Buck/Boost transformer capable of increasing line voltage by 25 Volts

**INSTALLATION MUST BE MADE IN ACCORDANCE WITH LOCAL ELECTRICAL CODES**

Note: This data based on PLASI I Power consumption but is also applicable to PLASI 2000

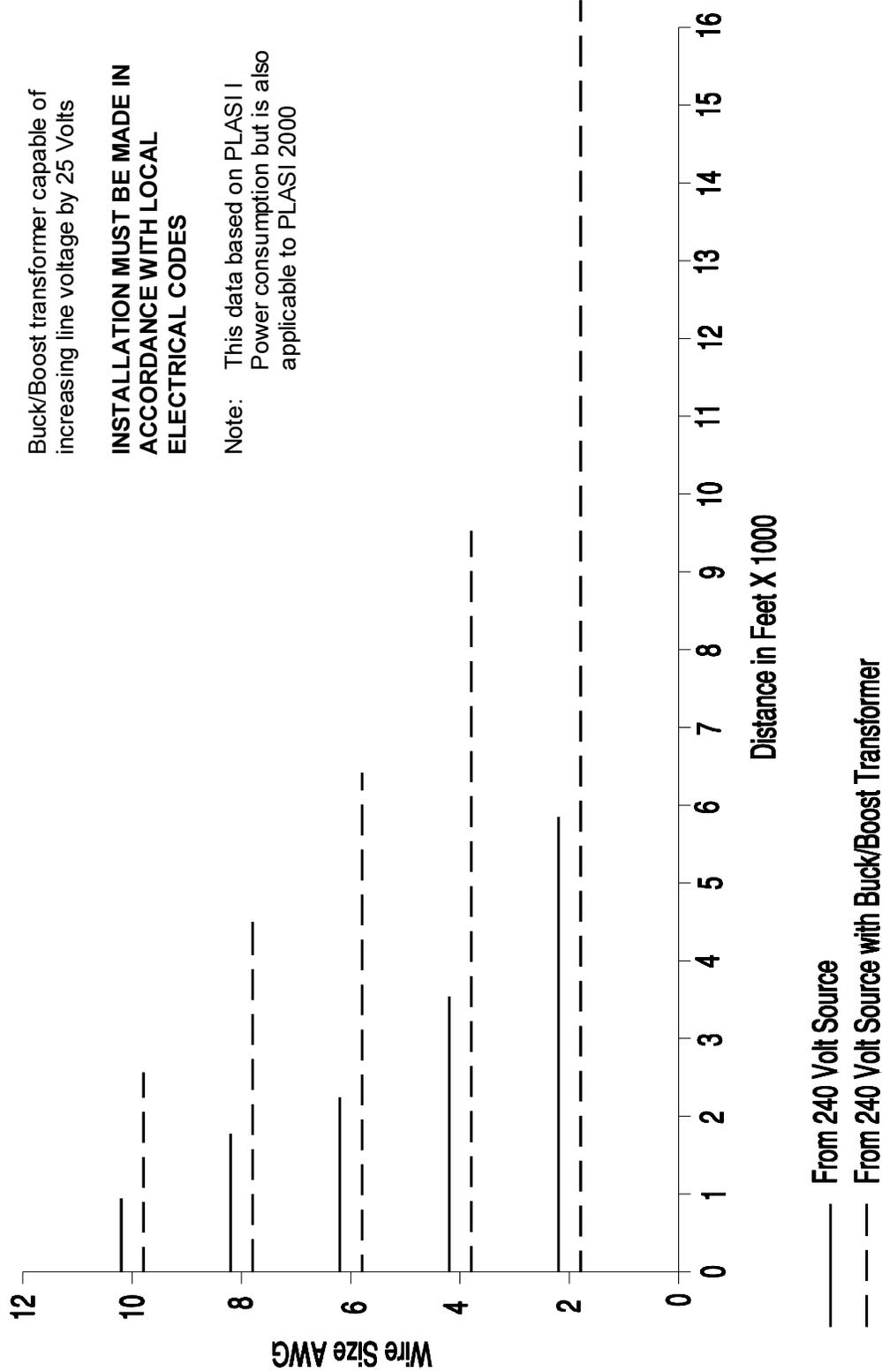
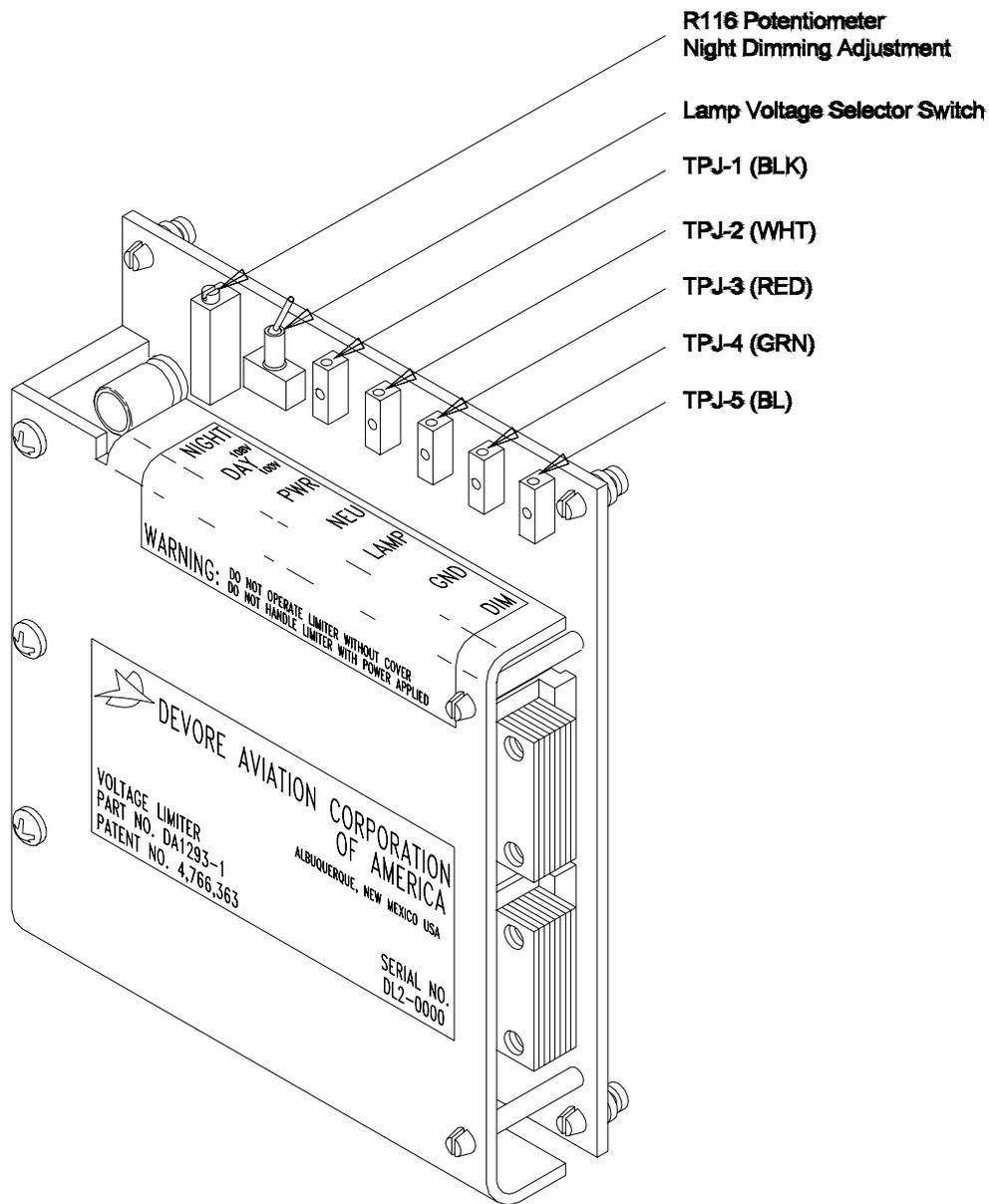


Figure 3b HAPI-PLASI 2000 System Electrical Installation Recommended Wire Size from 240 VAC Source





**Figure 4 Voltage Limiter**



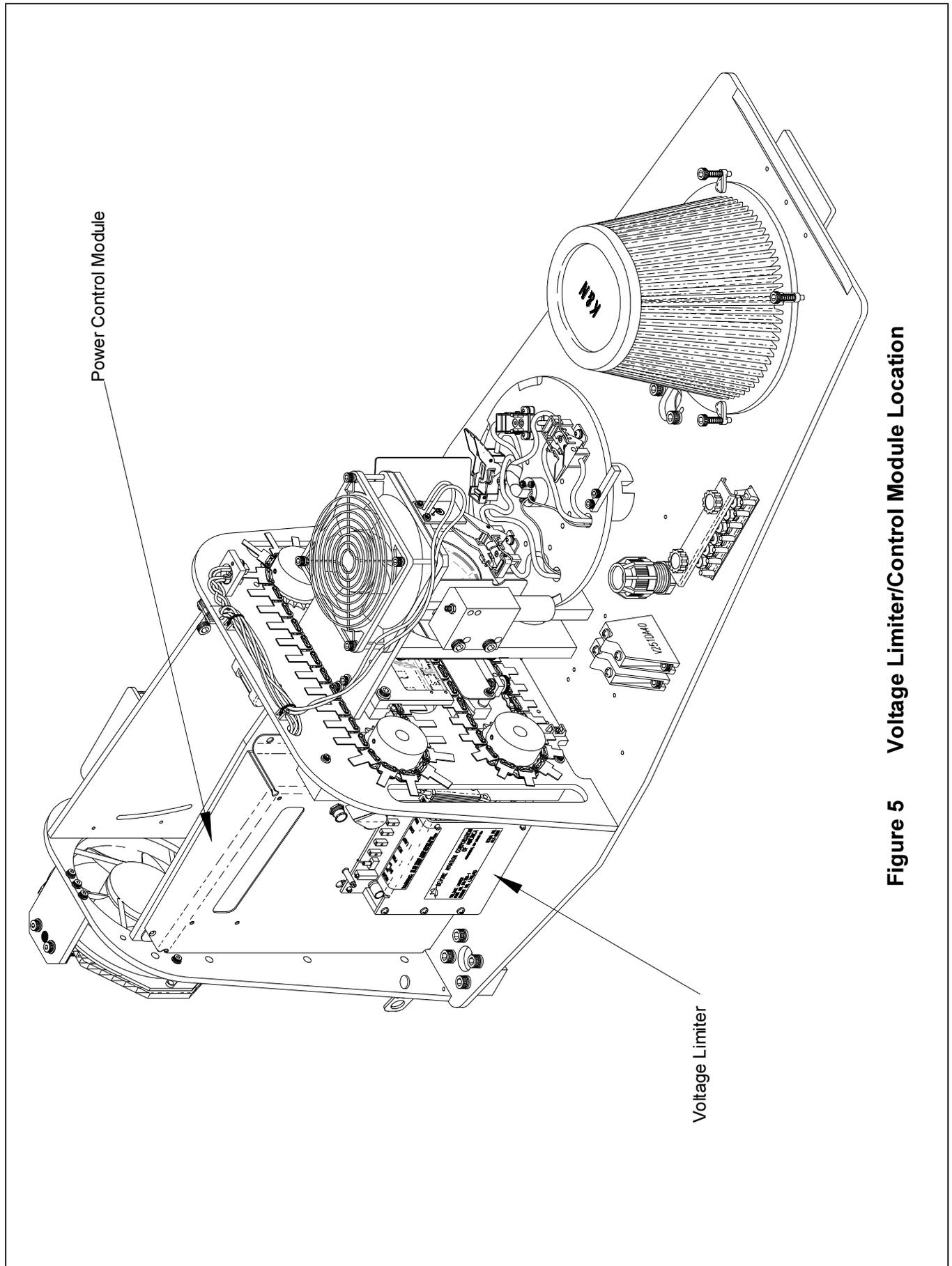
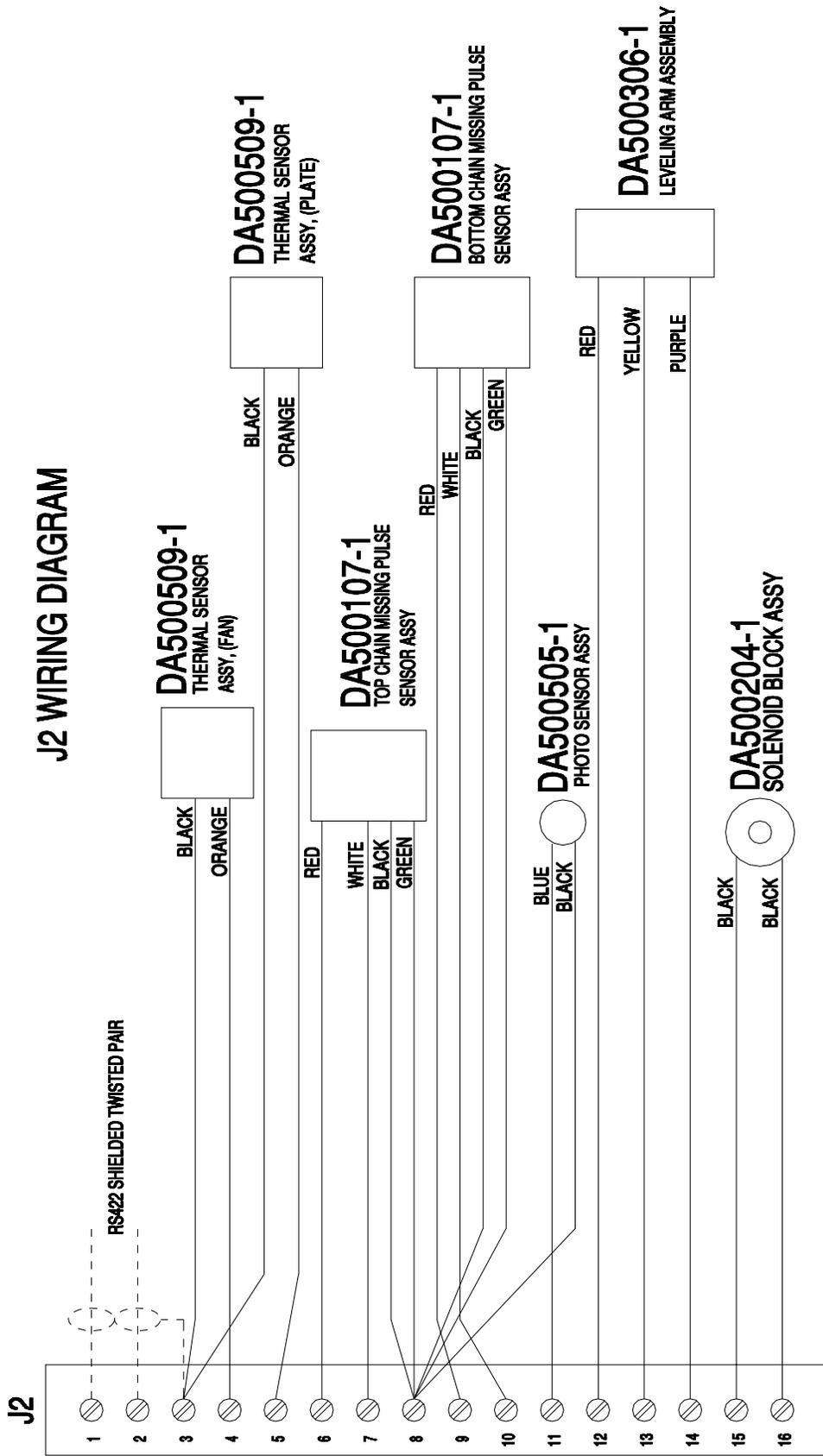


Figure 5 Voltage Limiter/Control Module Location





# J2 WIRING DIAGRAM

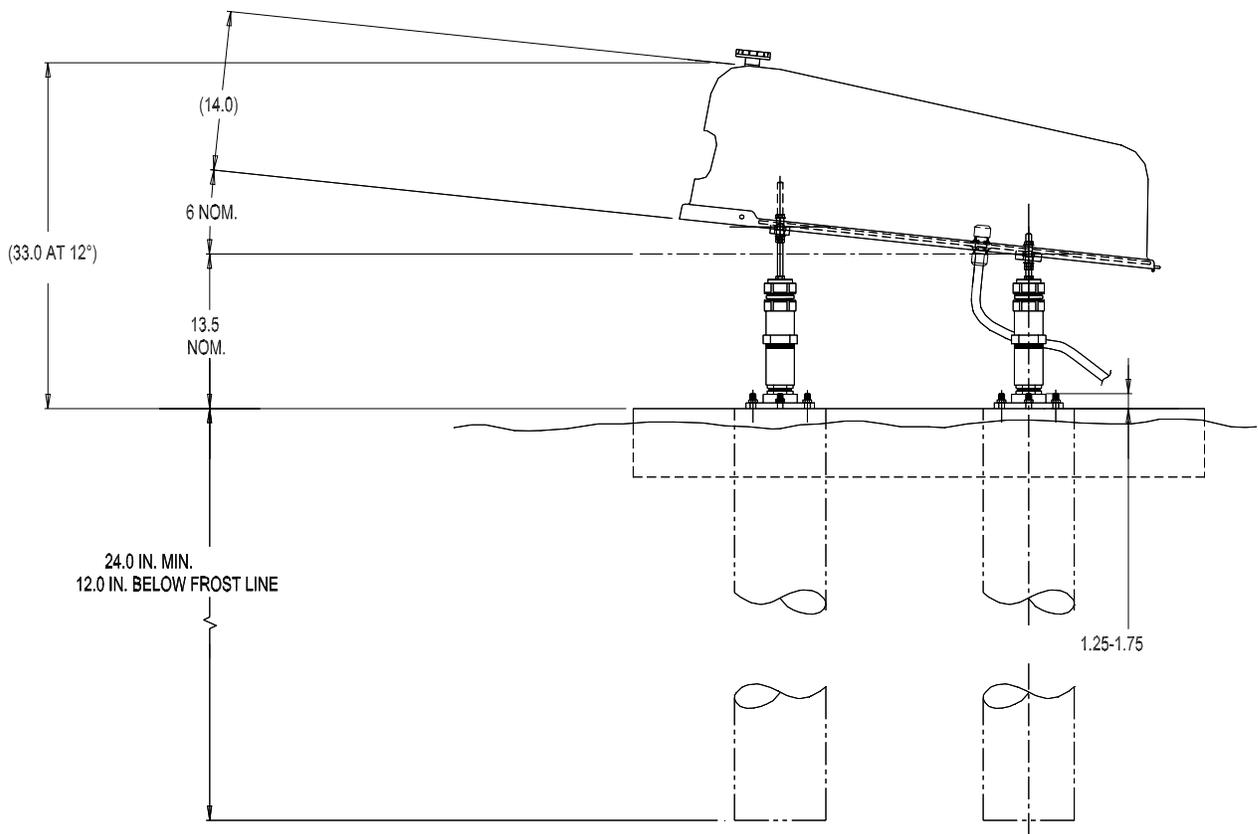
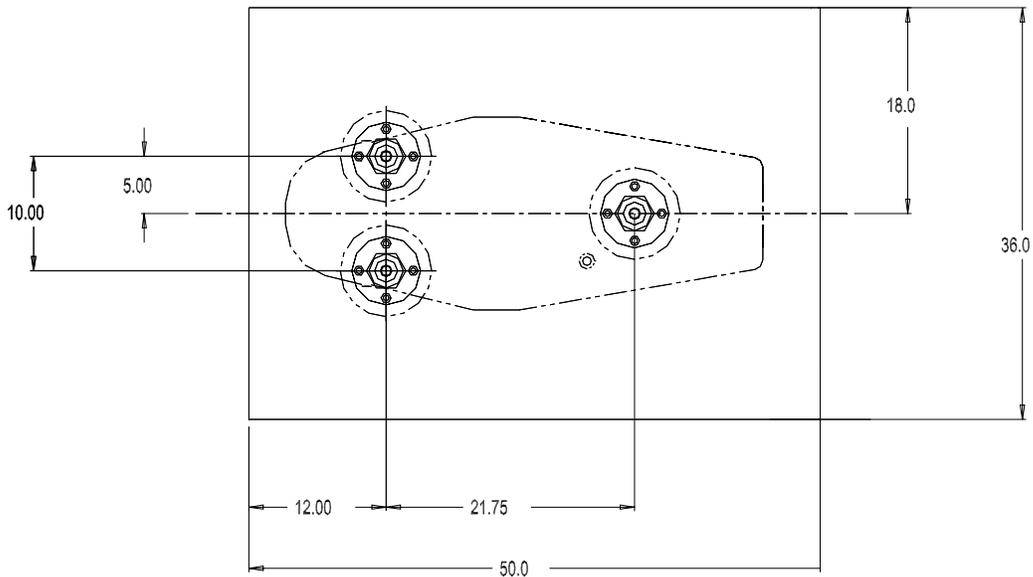


HAPI-PLASI 2000  
Wiring Diagram  
Ref. DWG DA500514

Figure 6b J2 Wiring Diagram

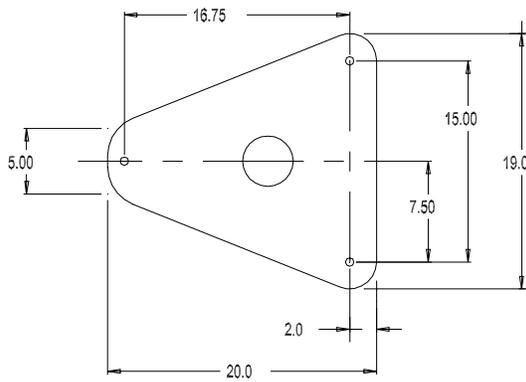




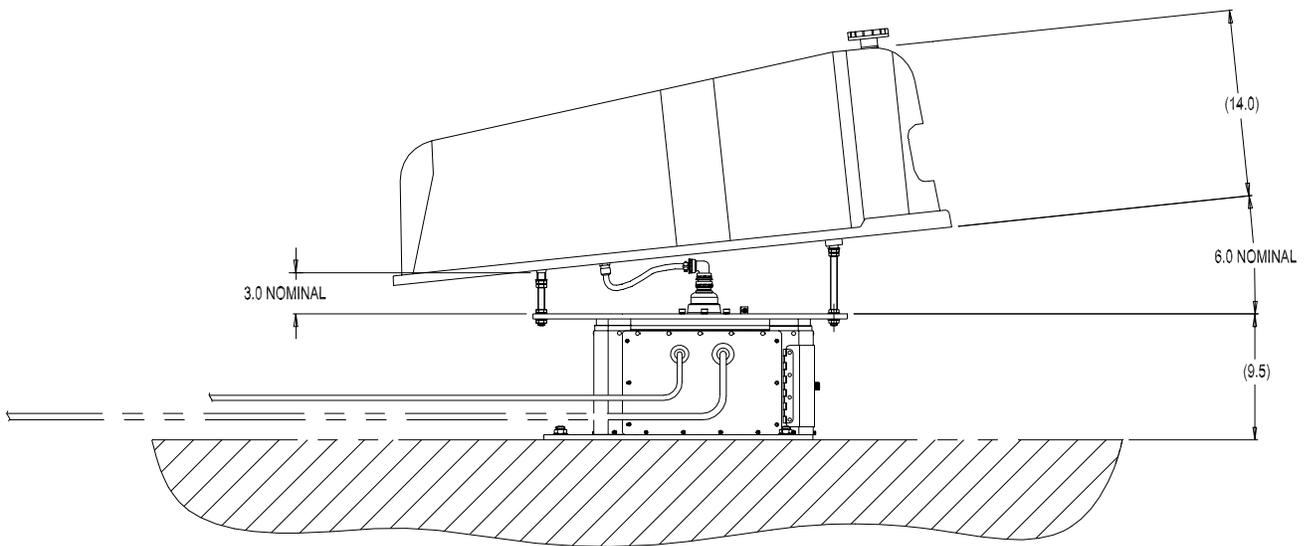


**Figure 7 HAPI-PLASI 2000 System Installation (Pad Mount)**



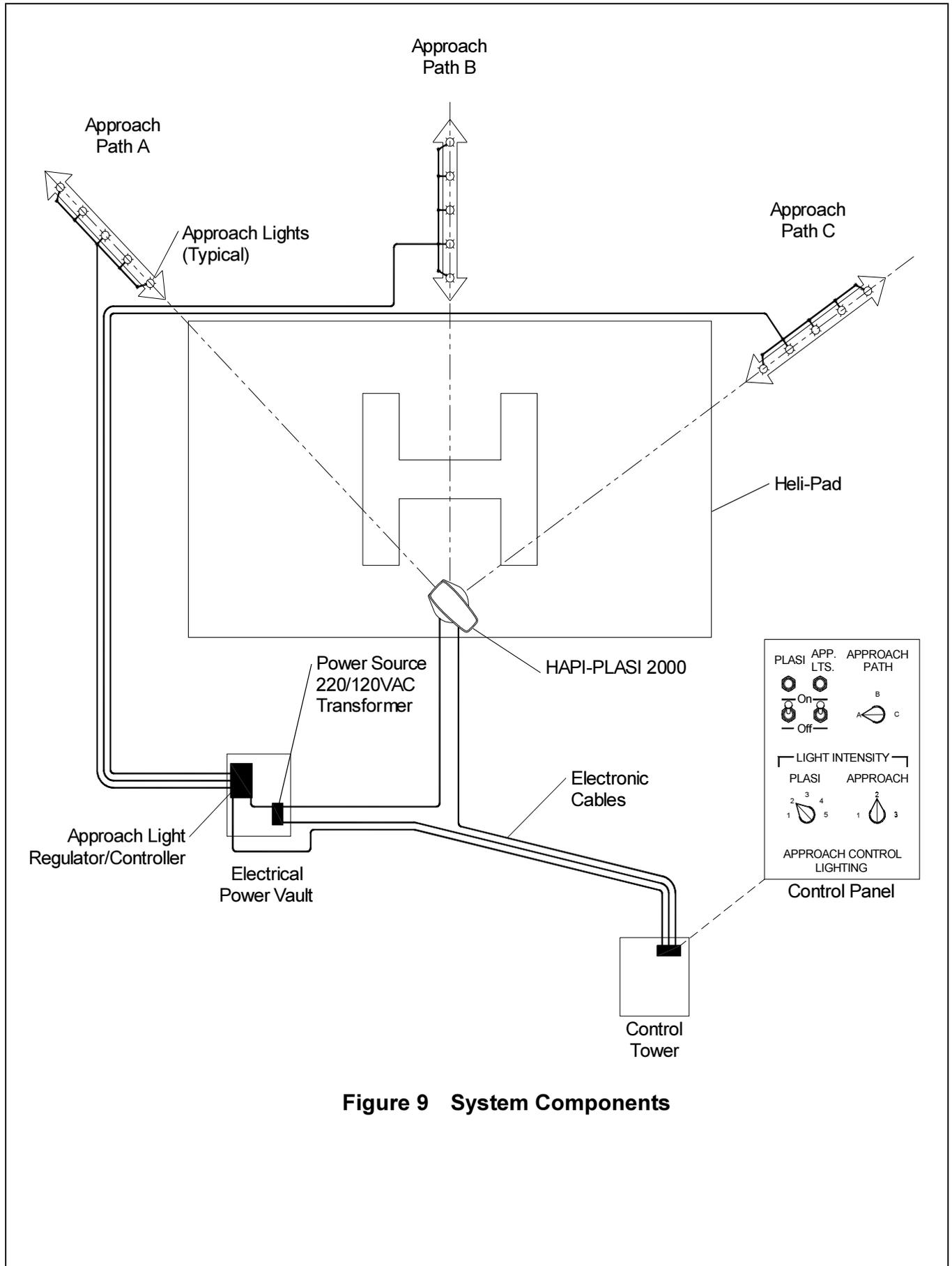


PLAN VIEW SHOWING DIMENSIONS OF BASE  
PLATE AND MOUNTING HOLE LOCATIONS



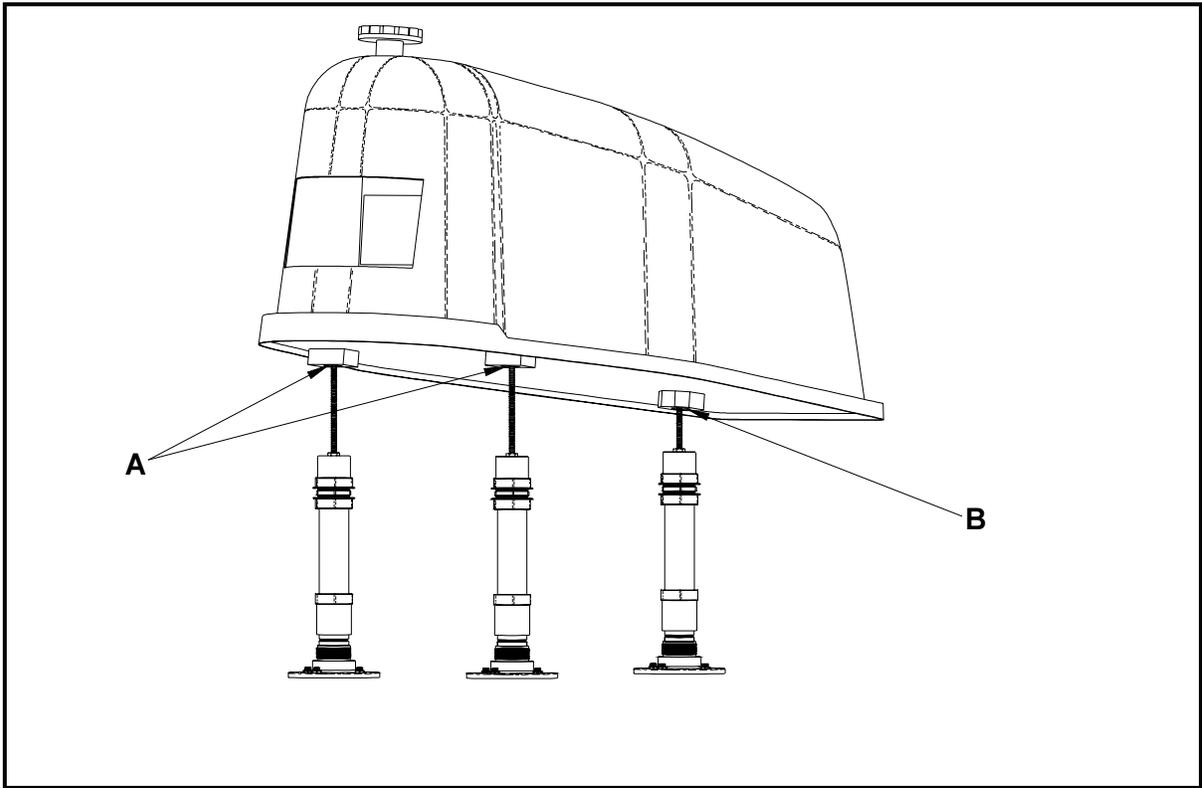
**Figure 8 HAPI-PLASI 2000 System Installation (Turntable)**



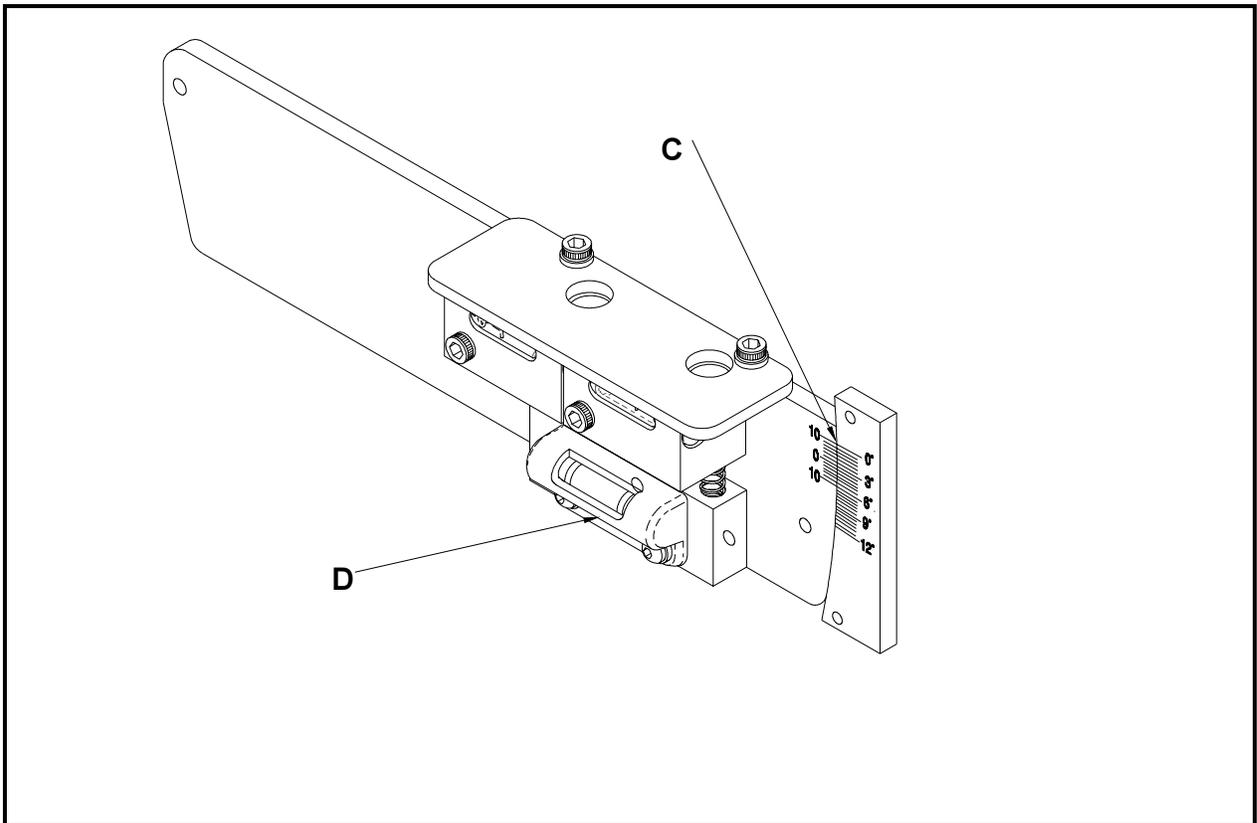


**Figure 9 System Components**



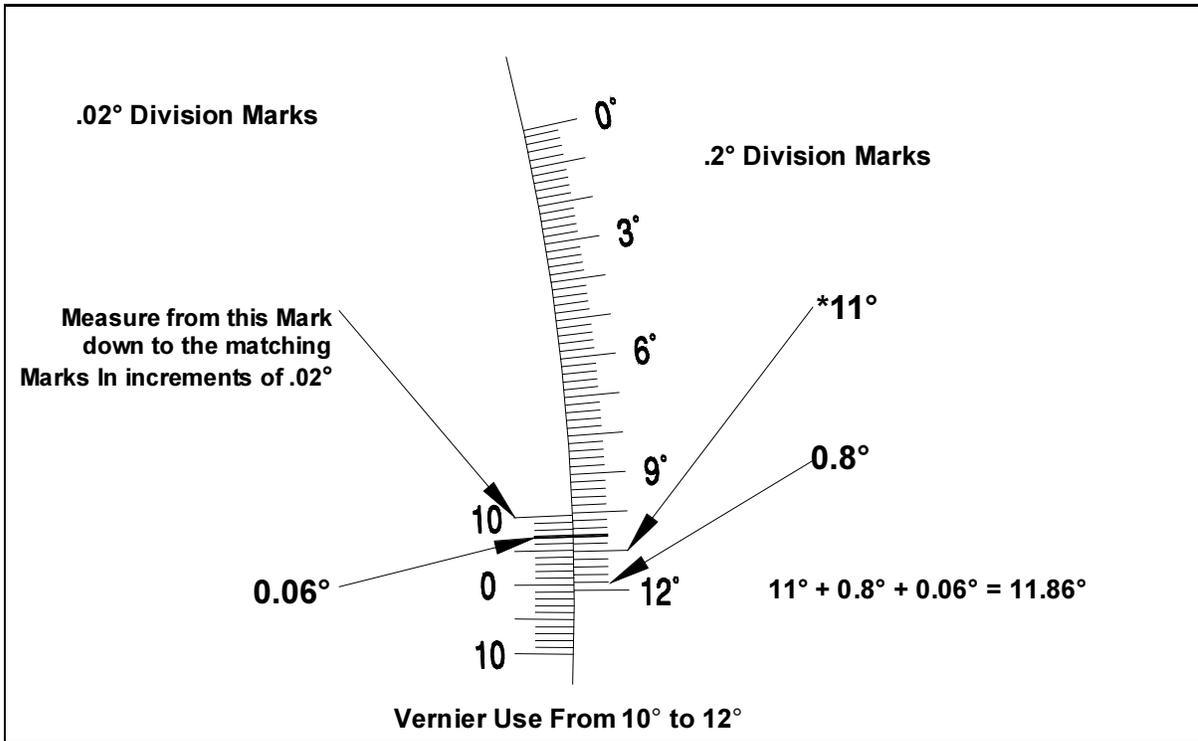
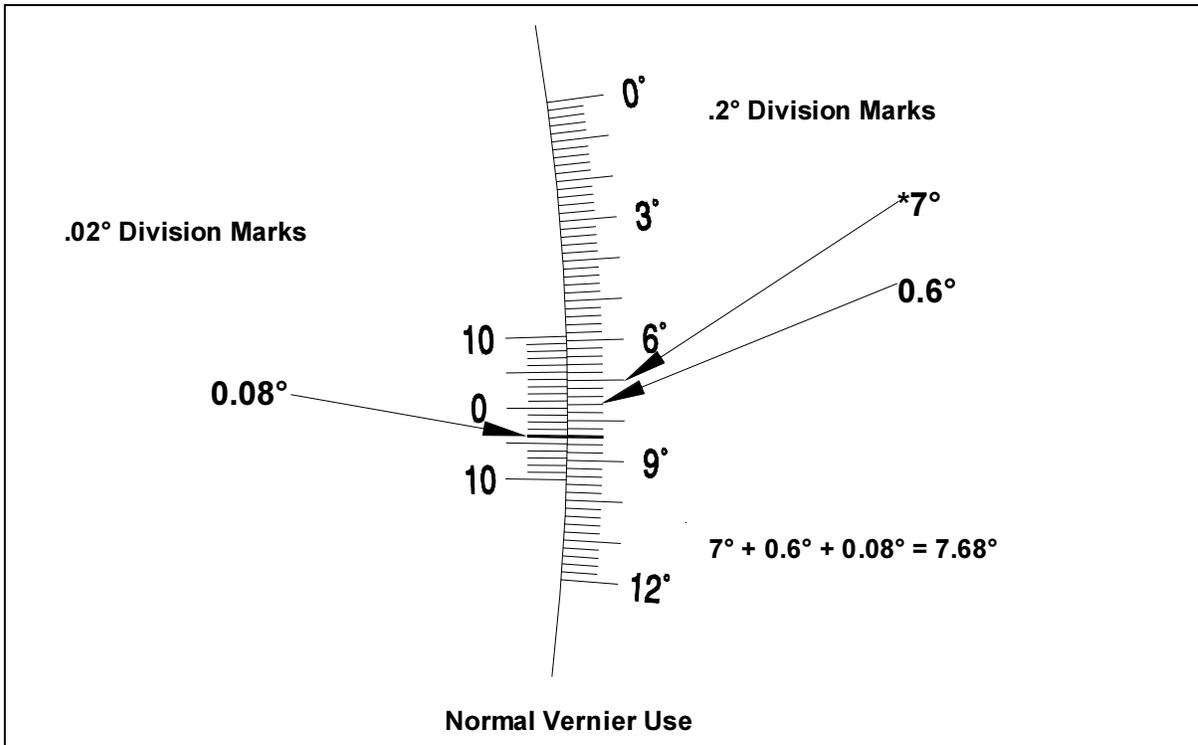


**Figure 10 Aiming, Lateral & Vertical**



**Figure 11 Aiming, Bubble Level & Vernier Scale**





**Figure 12 Aiming, Vernier Scale**



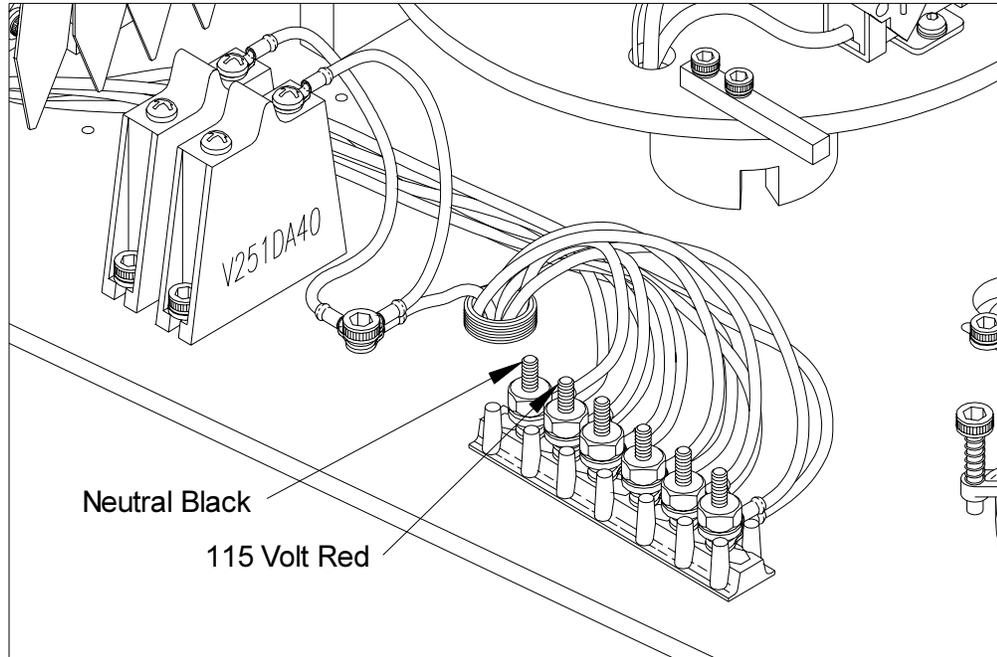


Figure 13 Voltage Test Positions

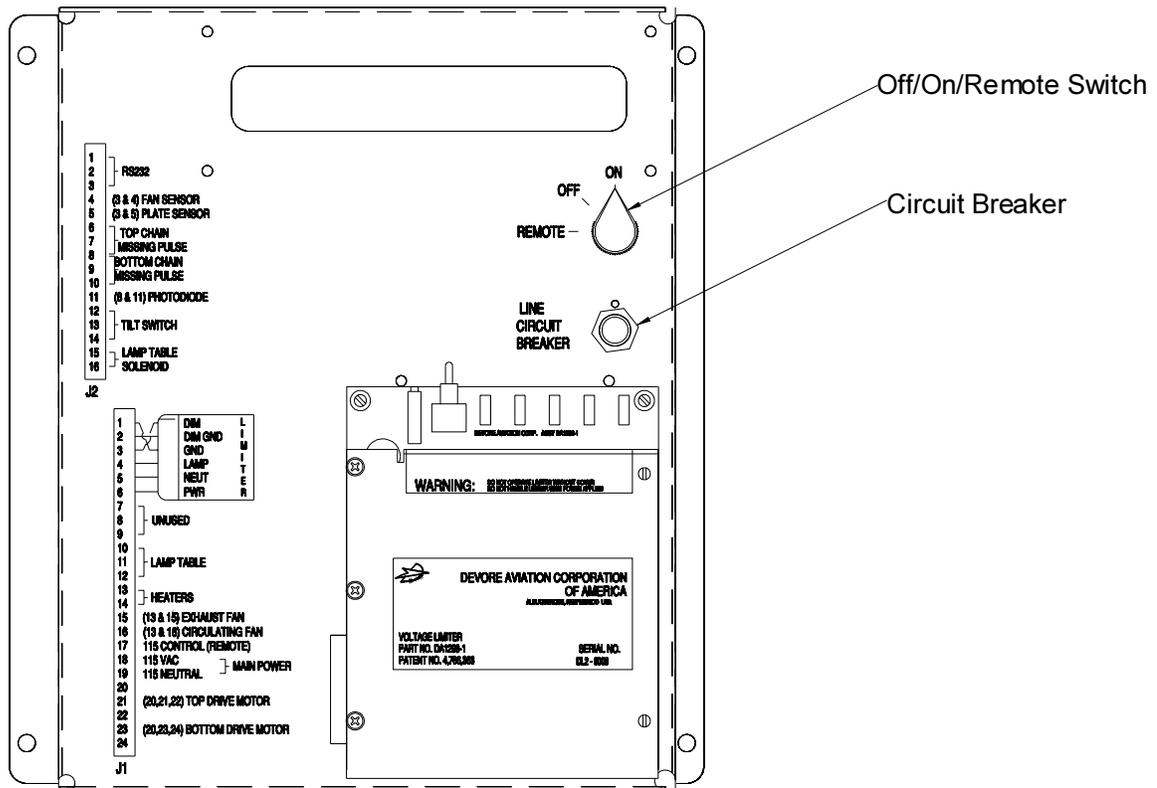
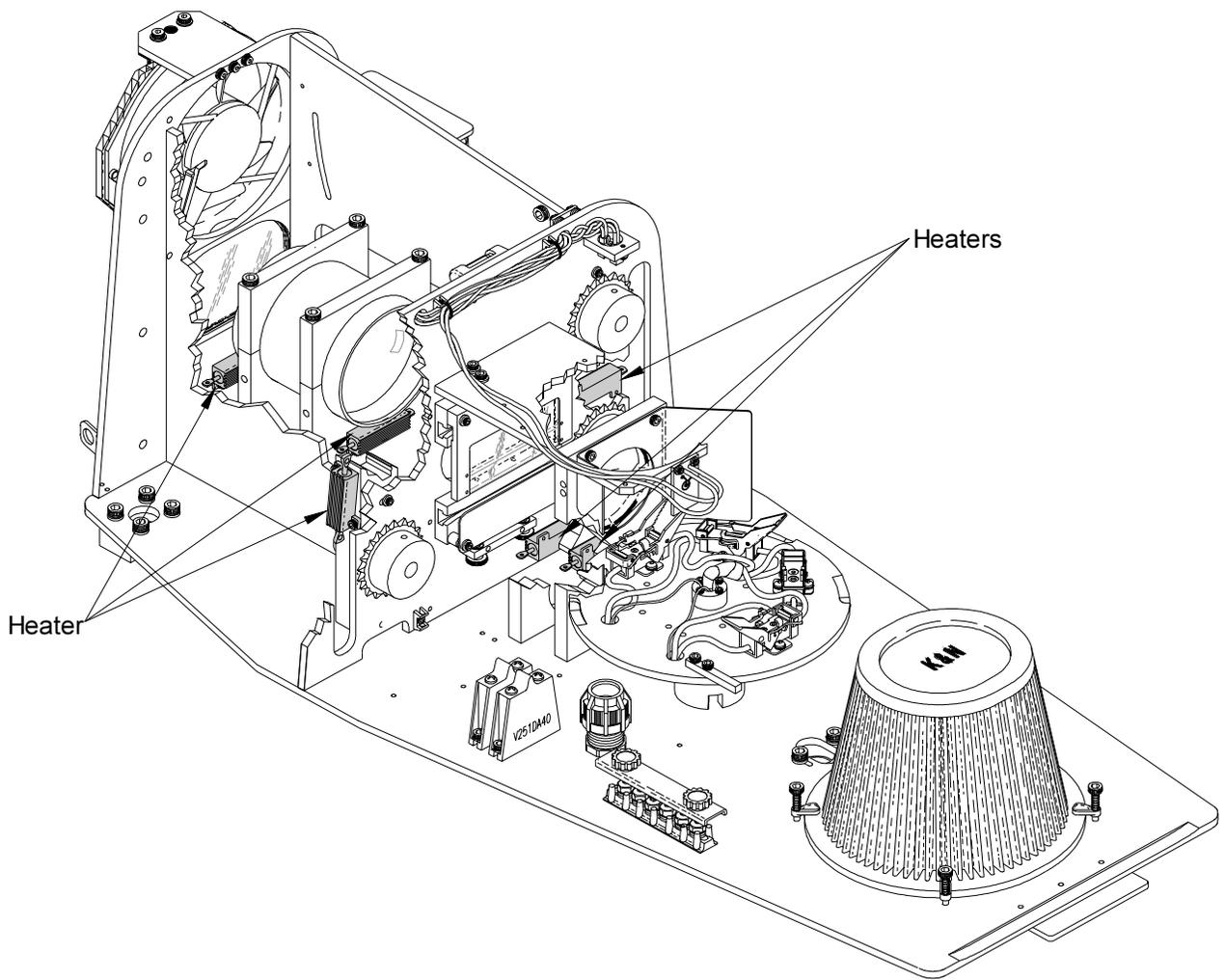


Figure 14 HAPI-PLASI 2000 System Control Panel





**Figure 15 Heater Locations**

