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for all your corona needs

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CS6005-6030

POWER SUPPLY

**INCLUDING
GENERATOR & ELECTRODE
MAINTENANCE**

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Corona Treating Process

Gases are normally very good electrical insulators or dielectrics. In the presence of a very strong electrical field a gas can be forced to break down and lose its insulating capability. During this breakdown the gas molecules begin to ionize. This enables them to provide a conductive path from one molecule to another. In a treating system the strong electrical field is generated across an air gap between the electrode assembly and the treater roll. A conductive path between these two electrodes will be completed when a sufficient quantity of gas (usually ambient room air) has become ionized. A sudden discharge across this path will now occur usually resulting in a bright flash or arc. This is very similar to a lightning flash going to earth or the arc between electrodes in a laboratory experiment. In order to prevent this arc from completely developing a solid dielectric barrier is placed in the path between the electrodes. This barrier partially interrupts the conductive path preventing a complete breakdown of the gas. Instead of a hot localized arc, a cooler diffuse glow will occur. This soft violet colored discharge indicates the incomplete breakdown of the gas and is called a corona. The material the dielectric or barrier is composed of is chosen so that enough current will flow between the electrodes and through it to sustain this corona.

During the treatment process, the web is passed through a high voltage discharge field and is exposed to the bombardment of high-energy particles. This corona field has the potential to break polymer bonds, cause micro-pitting, and deposit an induced surface charge with extremely high levels of strong oxidizing agents onto the web. Any one of or possibly all of these processes can alter the surface characteristics of the material in a way, which enhances the surface adhesion and its ability to accept printing inks, adhesives, coatings, etc.

Digital Treater Power Supply CS6000 Series

Introduction

About This Manual

This manual contains information for installation, operation, maintenance and repair. It should be read by all designers, installers, operators and maintenance personnel who will use or service this equipment.

This manual covers the CS6000 Digital series of corona treater power supplies. Options are covered in a separate section. Some of the references in the options section may not pertain to your particular equipment configuration. Each part of the power supply system will be individually addressed

If you have any queries regarding the installation or use of the product, you may contact a Corona Supplies representative for advice.

Product Description

This equipment controls the level of power applied to the high voltage transformer for corona treating. Corona treating equipment is used to prepare the surface of a web to allow improved adhesion for inks and other coatings. This is accomplished by passing the material through a high voltage, high frequency electrical discharge. As the web material passes over the ground roll a high voltage electrode produces a discharge, through the web, and into the ground roll. The surface of the web is modified during this process.

The Digital CS6000 treater does this by means of a high frequency sub-resonant IGBT inverter and digital power supply controller. The CS6000 is available in many sizes to handle a wide variety of treating applications. The equipment is designed and built for operation in a non-hazardous atmosphere. The enclosure door is safety interlocked to prevent access to the electrical components when electrically energized.

The power supply is supplied in a NEMA 1 wall mountable painted steel enclosure. The cabinet is forced air-cooled and is provided with a hinged front access door for ease of cleaning and maintenance.

Features

The Digital CS6000 has some unique features, which differ from previous designs.

- **Dual micro-controllers** - One controls the operator functions and system interfaces, while the other controls the inverter with a digital control algorithm.
- **High intensity digital display** - Easy to read LED's providing continuous display of power, voltage, current, frequency, run hours, and kilowatt-hours.

- **Diagnostic display** - LED indicators signal operating faults and conditions.
- **Humidity Compensation Control** – Reliable starting of corona treating equipment in extremely humid conditions.
- **Auto Start Capability** – Automatically starts inverter with internal or external control signal.
- **Auto / Manual Current Trip** – Trip reset can be done automatically to prevent untreated web.

Safety

Equipment Safety Features

The electrode magazine assembly is interlocked to prevent removal of the electrodes when equipment is operating.

The ground roll is interlocked for operator safety, equipment protection, and to prevent web damage.

The exhaust pressure is monitored for operator safety and equipment protection.

Proper maintenance of the equipment, *including periodic inspection*, is necessary to maintain the highest degree of safety.

Any moving parts could cause injury if a person comes in contact with them. The web of material moving through the equipment is no exception and caution should be used when working around the equipment during operation.

For your safety, you should never bypass the interlocks or guarding system while the equipment is operating.

Precautions

Corona Supplies makes every effort to build equipment that is safe and as free of hazards as technically possible. However, not all hazards can be totally eliminated by design. It is therefore imperative that all personnel who will use or service the equipment become familiar with this manual. Areas in this manual concerning safe operation are identified with one of the following symbols.



CAUTION

- The corona is produced by the discharge of high voltage, high frequency electricity. Under certain circumstances, such a discharge can leap several inches through the air ***Serious injury, or possibly death***, could occur if a person comes into proximity with components that carry high voltage.
- Input power must always be ***disconnected and locked out*** at the source before service or setup of the equipment.
- All guards, shields, and barriers must be in place before starting the equipment.
- Do not wear neckties, jewelry, loose clothing or other items that can become caught in moving parts or mechanisms.
- Do not operate, troubleshoot, or maintain the treater station or power supply while under the influence of any type of drug or alcohol.
- Always observe all safety warnings and notices on the equipment and in this manual.

Installation

Unpacking

Your Series CS6000 Digital High Frequency Corona Treater has been completely tested, inspected and carefully packaged prior to shipment. Please remove packing materials carefully and watch for any visual signs that the equipment may have been damaged. Also ensure that all packing material is carefully inspected for components which may be hidden within them. If upon arrival you find that the equipment has been damaged in route, please do the following:

1. Retain all packing materials in which the equipment was originally shipped for possible inspection by the carrier.
2. Notify the carrier immediately upon confirmation of damage and file appropriate claim.
3. Notify Corona Supplies as soon as possible for instructions regarding the damaged equipment.

NOTE: *Failure to contact carrier prior to installation of equipment or disposal of packaging materials may result in loss of claim from the carrier.*

Care should be exercised to prevent damage to the high voltage transformer terminals.

Refer to the manual provided with your treater station for separate unpacking instructions.

CAUTION

Some circuits and components in this equipment are sensitive to *ElectroStatic Discharge* (ESD). Servicing of internal parts should be performed only at a static safeguarded work area. At the very least a static dissipating wrist strap should be worn to prevent damage to sensitive electronic components. Do not remove a board or other static sensitive component from its protective package without taking precautions against static.

Mounting

Power Supply - The corona treater power supply may be mounted in nearly any convenient location. The 6000 series power supply is an air-cooled unit which is designed to operate in ambient temperatures up to 40°C (104°F). It is very important to remember that the airflow around the cabinet should not be restricted when a mounting location is being considered. A minimum of (1) one-foot (0,3 m) of clearance is required on both sides of the cabinet for adequate ventilation. It is also necessary to allow for proper service clearance to open the front access door. The cabinet is designed for wall or pole mounting only and must be mounted so the disconnect is between 0,6 m and 1,9 m (2.0 and 6.2 feet) from the floor.



**IT IS THE CUSTOMER'S RESPONSIBILITY TO ENSURE THAT
ALL APPLICABLE SAFETY CODE REQUIREMENTS ARE COMPLIED
WITH WHEN INSTALLING THIS EQUIPMENT.**

High Voltage Transformer - The high voltage transformer is oil filled and should always be mounted in an upright position with the tank cover on top and the wiring terminals sideways. (See Outline Drawings in the Service Section) It is very important to mount the transformer as close to the treater station as possible to reduce the length of high voltage cable. This will help to reduce the distance over which the special handling of high voltage conductors is required. Refer to the section on wiring for further information. This transformer is also designed to operate in a maximum ambient temperature of 40°C (104°F) and requires a (1) one foot (0,3 m) clearance on all sides of the tank. Service clearance must be provided to permit ready and safe access to the equipment for maintenance. Refer to Article 110-32 of N.F.P.A. 70 (National Fire

Protection Association -The National Electrical Code) and any other applicable safety codes for specific requirements.


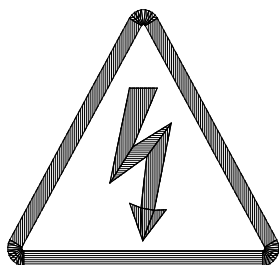



FAILURE TO ENCLOSE THE HIGH VOLTAGE WIRE IN A CONDUCTIVE CONDUIT CAN CREATE A HAZARD TO PERSONNEL. PLEASE FOLLOW THE SUGGESTED INSTALLATION INSTRUCTIONS BEFORE OPERATING THIS EQUIPMENT.

Optional Input voltage transformer - This optional transformer, when furnished, may be mounted in any convenient location, which allows for adequate air flow and service clearance around the transformer. A minimum of (1) one-foot (0,3 m) of clearance is required around all sides of the cabinet to allow for adequate ventilation and cooling. Service clearance will be predicated by the need to comply with local, State and Federal electrical codes such as N.F.P.A. 70. The transformers are designed to operate in ambient temperatures up to 40°C (104°F) maximum. Operation in temperatures exceeding 40°C (104°F) may cause premature failure of the transformer and possible damage to other components.

Remote Control Station - The Remote Control Station has a mounting flange with four-.31” diameter mounting holes, suitable for mounting the Station on a wall or panel. The unit weighs 21 lbs. (0.95 kg).

Refer to the printed material furnished with the Remote Control Station and the system interconnect diagram for details on installation and set up.

 <p>ATTENTION</p>		 <p>CAUTION</p>
<p>Risque de choc électrique.</p> <p>Couper le courant avant l'entretien.</p>		<p>Risk of electric shock.</p> <p>Disconnect power before servicing.</p>

Wiring

Terminal assignments for the power supply interface are described on page 7.

The power supply utilizes 24-volt signals for the auto start and any push button or contact closures. When installing wiring between the power supply and external devices, proper routing and grounding will be necessary. Low voltage lines must not be routed alongside or in the same conduit as inverter output leads. High voltage lines will inject noise into the low voltage lines. Shielded wires are recommended for the low voltage lines because corona-treating equipment can radiate high frequency noise through the air.

AC mains supply - The power supply requires an input voltage of 240 VAC (with ground). Single-phase input is used on sizes up to 2.0 kW and three-phase on 2.5 kW and above. See Input Power specifications on page 22 for amperes per phase. The customer must provide this supply voltage circuit. If the required AC main voltage is not available, an optional input transformer must be installed to provide for the required voltage. In either case, a fused disconnect should be provided to insure proper over current and short circuit protection.

There are two methods to connect the AC mains supply. Which method to use is determined by the part number of the power supply. The part number of the power supply is located on the rating plate. The 11th digit in the part number will determine which method to use.

If the part number is PI60xx-xxx0xx then use the following method. Connect the 240 VAC supply lines to the power terminals on the TB1 terminal strip. Connect the input circuit's equipment safety grounding conductor to the grounding terminal labeled "PE" on the TB1 terminal strip inside the power supply cabinet.

If the part number is PI60xx-xxx1xx then use the following method. Connect the 240 VAC supply lines to the disconnect switch located on the TB1 terminal strip. Connect the input circuit's equipment safety grounding conductor to the grounding terminal labeled "PE" on the TB1 terminal strip inside the power supply cabinet.



THE HIGH VOLTAGE TRANSFORMER SHOULD NOT BE OPERATED WITHOUT PROPER GROUNDING CONNECTIONS. PRIOR TO OPERATING THE EQUIPMENT, PLEASE ENSURE THAT THE TRANSFORMER TANK IS PROPERLY CONNECTED TO AN EQUIPMENT SAFETY GROUNDING CONDUCTOR AND THE METAL RACEWAY OR CONDUITS TO WHICH IT IS ATTACHED.

High Voltage Transformer Primary - The connection between the power supply enclosure and the high voltage transformer should be accomplished by a twisted pair of wires with insulation rated for 600 VAC at 90 °C. These wires 1073 and 1074 which are connected to terminal block TB1 should be twisted to a minimum of 3 turns per foot (10 turns per meter) and routed inside a non-magnetic type conduit. Due to the nature of the high frequency current carried by these conductors, a standard ferrous metal (magnetic)

conduit or raceway will be inductively heated and may cause the wire's insulation to fail. Electrical metallic tubing (EMT) or steel raceways are *not* suitable for this purpose. Aluminum or PVC conduits and raceways are normally recommended for these installations.

High Voltage Transformer Secondary - The connection between the high voltage transformer and the treater station electrodes must be installed with extreme care to prevent failure of these connections. The high voltage wire should be rated for a minimum voltage of 20 KVDC. There are two methods on how the secondary wiring can be run. The determination of which method is used is based on the type of treater station purchased with this power supply.

Method 1 (3/8" diameter silicone wire)

We recommend using silicone wire type insulation routed through a metallic conduit. The high voltage wire should be centered inside the conduit and a 2" (5 cm) clearance should be maintained between the wire and the inside surface of the conduit. Failure to suspend the wire away from ground referenced objects may result in arcing or failure of the wire and possible damage to the equipment.

In addition, a high voltage return wire is required between the stud on the high voltage transformer and the treater station ground. We recommend using a #10 AWG wire routed through a separate conduit or a #6 AWG wire strapped to the *outside* of the high voltage conduit as allowed in the NEC Article 250-92.

Caution: Do not use the safety ground (Earth Ground) as a current carrying return path for the high voltage transformer. Failure to comply with this recommended installation can result in intermittent operation or reduced reliability.

Method 2 (3/4" diameter silicone braided wire) (BP70082-**))

This wire assembly is rugged enough to be considered as a cable and does not need to be run in a metallic conduit. Care must be taken at the high voltage connections. The termination point cannot be within 2" (5 cm) of equipment ground. The wire mesh braiding must be grounded at both ends of the cable. This mesh braiding takes the place of the high voltage return conductor.

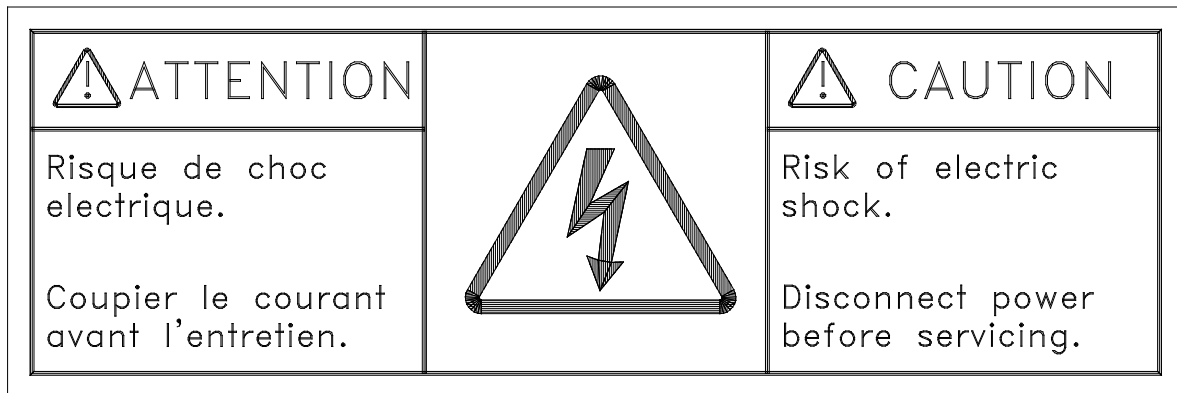
Customer Alarm - A set of normally open/normally closed (N.O./N.C.) relay contacts are available for actuating an audible/visual alarm or PLC input. Whenever the system enters an alarm condition, this relay will be energized causing the contacts to change state. It will remain energized until the operator silences the alarm by pressing the appropriate function key, as is later described in this manual.

The alarm is connected to the interface terminal block at terminals TB1-803, TB1-804 and TB1-805 (N.O., COMMON and N.C. respectively). These contacts are rated for 250 VAC at 5A-resistive/2A inductive load. If an inductive load is to be connected, please install an arc suppressor across the contact. Refer to the System Interconnection diagram for the location of these contacts.

Operating Procedures

6000 Digital Controls

Power Interlock - Always turn off AC mains power disconnect before servicing the equipment. The Power Supply cabinet door is interlocked to disconnect power from the inverter and control circuits when the door is open. Caution, mains power will be present inside the cabinet until the power disconnect is turned off.



Corona Manual Stop - Pressing the Corona Manual Stop button removes power from the Power Supply. A red light in the button indicates that power has been disconnected. Pull the button out to re-apply power to the Power Supply. The red light turns off to indicate that power is re-applied.

Display Panel - The operator panel shown in Figure 1 provides a simple, yet effective means for the operator to control the power supply and ancillary equipment. The information below describes each of these controls and a brief explanation of their function.

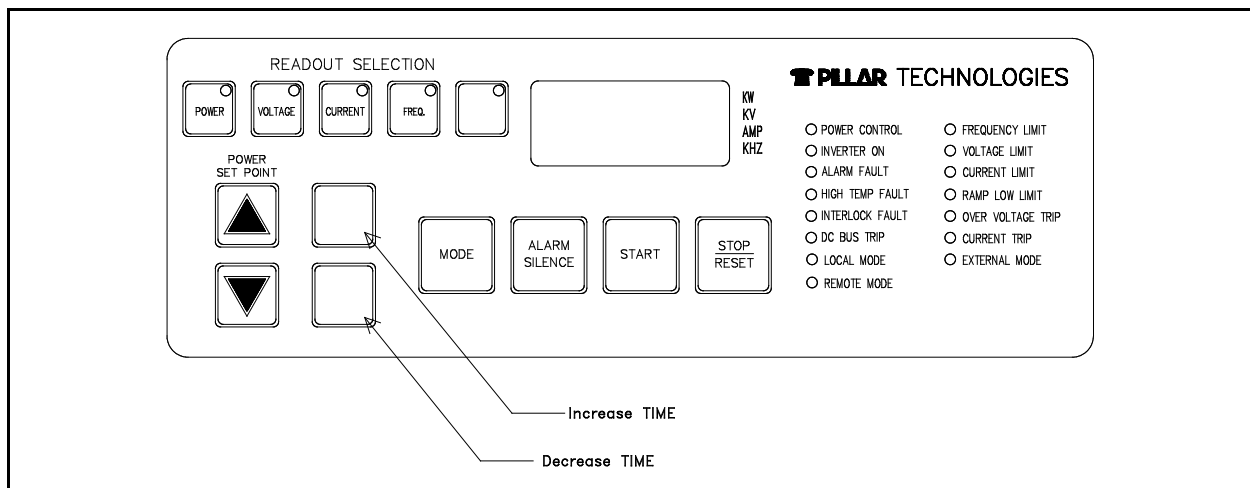


Figure 1 - Operator Controls

Display - This is a three-digit LED display that shows the output power, voltage, current, frequency, kilowatt hours, and run time hours of the inverter. The numbers are displayed in high visibility red.

Display units - Display readings for corona treater inverters will be in actual rated power in Kilowatts (kW), voltage in Kilovolts (kV), current in Amperes (A) or frequency in kilohertz (kHz), depending on the status of the readout selection keys and indicators to the right of the numeric display. The fifth readout selection key without a label is the kilowatt-hour key. When selected the accumulated kWh of actual run time will be displayed. If the kWh reading is greater than 999, the readout will flash the thousand indicator first and then switch to any additional hours beyond the thousands.

Readout Selection Keys - These keys select the function to be displayed in the three-digit display. An LED indicator within the button indicates the function being displayed.

Alarm indicators - The ALARM FAULT indicator lights when the actual power deviates by more than +/- 5% of full scale from the selected power. Also, the loss of Treat Indicator (LTI) relay will activate to provide other visual or audible notification, as provided by the customer. The LTI relay will be inhibited if ALARM SILENCE is pressed.

Function keys - These four keys provide access to basic operating modes.

MODE - This key will select local, remote or external control mode. External mode can be computer interface, proportional speed, or watt density control. Pressing the MODE button repeatedly will cause the LOCAL MODE, then the REMOTE MODE, and then the EXTERNAL MODE LED to light. The power supply will return to whatever mode was selected when it is turned off, then on again. (The appropriate mode indicator will be displayed on the control panel.)

ALARM SILENCE - This key de-activates the alarm relay function.

START - This button is pressed to start the inverter. The INVERTER ON LED shows that the inverter is on.

STOP/RESET - Turns the inverter off. The INVERTER ON LED turns off to indicate that the inverter is off. Press this key to clear any faults, which prevent the inverter from operating.

Up and down arrows - These two keys are used to fine-tune the power setting.

- When the system is running normally and the default display is on the message display, the POWER SET POINT UP and DOWN keys will increment or decrement the power setting. The preset value will be displayed when the inverter is not running and the POWER SET POINT UP or DOWN button is pressed.

Auto / Manual Trip – The default setting for this function is Manual trip. In this setting, the inverter will shut off after realizing a current trip condition and stay in the off condition until the reset button is pressed. The power supply can then be restarted. In the Auto trip mode, SW1 switch position 4 on the CB10205-3 display board is on, the inverter will shut off after realizing a current trip but will then automatically restart after one second. If the current trip condition is still present the inverter will shut off again and repeat this cycle for up to ten trips. After the tenth trip the inverter will stay off and will require

a manual reset and start.

CAUTION: Repeated trip cycling may cause damage to the power supply. Locate cause of current trip and repair as soon as possible to avoid potential failures.

Auxiliary Start / Stop – This feature allows an auxiliary starting and stopping of the inverter by means of separate momentary closures for starting and stopping. These can be used in conjunction with the standard START and STOP buttons on the display panel. If a single external control of the START / STOP operation is desired, switch position 7 on SW1 from CB10205-3 display board must be on. A maintained closure of the auxiliary start signal will keep the inverter on unless a fault occurs or the STOP button on the display is pressed. If either of these conditions should occur, the inverter must be restarted by first pressing the START button on the display panel.

Kilowatt-hours – The BLANK button next to the frequency display button is being used for kilowatt-hour indication. Pressing this button will display the number of accumulated kilowatt-hours on the machine when in the run condition. If you want to reset the number of accumulated hours back to zero, you need to hold the BLANK button for a few seconds until the display shows zero.

Run Time hours – The number of clock hours that the machine is operated is recorded by the microprocessor and can be viewed on the display. To view the accumulated hours you need to press the ALARM/SILENCE button and the BLANK button next to the frequency selection button simultaneously.

Sensor Frequency Monitor – The frequency signal received from the inductive or optical speed sensor can be display on the operator panel to aid in setup and maintenance. To view the frequency you need to press the ALARM/SILENCE and the FREQUENCY button simultaneously.

Humidity Compensation Control - The Humidity Compensation Control provides a means of conditioning the high voltage circuit, when it is used in a high humidity environment. This feature should be used when the treater station cannot be operated at the desired power level due to repeated breakdown in the treater high voltage circuit under high humidity conditions.

When the Humidity Compensation Control mode is selected, the power supply initially applies a low power level (10% of the power set point), then gradually increases it to the power set point. This time period is adjustable from 1 to 30 minutes. If an overload occurs and the control board is set to auto trip, the power will turn off for 1 second and then automatically restart at 2/3 the power it was at when the overload occurred or 10% of the power set point, whichever is greater. If the control board is set to manual trip, the power supply will not restart automatically after an overload, but will require a manual reset. If ten overloads occur or the overload does not go away after two seconds, the inverter will automatically turn off and will require restarting. If the overloads continue, the ramp time should be increased as repeated overloads may damage the treater. Every time an overload occurs, the time it takes to reach the power set point will be increased by the time it takes to get back to the level at which the overload occurred. The rate at which the power increases will remain constant.

Instructions

1. To adjust the compensation time, use the two buttons to the right of the power set point up/down arrows as shown in Figure 2. The top button will increase the time up to 30 minutes and the bottom button will decrease the time down to 1 minute. **The time may not be adjusted while the inverter is on.**

2. To start the inverter in Humidity Compensation Control mode, hold down the POWER (readout selection) button and press START. The initial power will be set at 10% of the set point and the readout selection light will blink until the set point has been reached or the inverter has been turned off. This sequence must be repeated each time that Humidity Compensation mode is desired.
3. To start the inverter in normal mode, press START without pressing any other buttons.

Note: If Constant Humidity Compensation Control is needed every time the START button is pressed, a dip switch located on the back of the display board can be turned on to enable this feature. This is switch position #5 on SW1, which will enable the constant HCC mode. Note: It is necessary to cycle the main power off and on after changing the switch position to activate this feature.

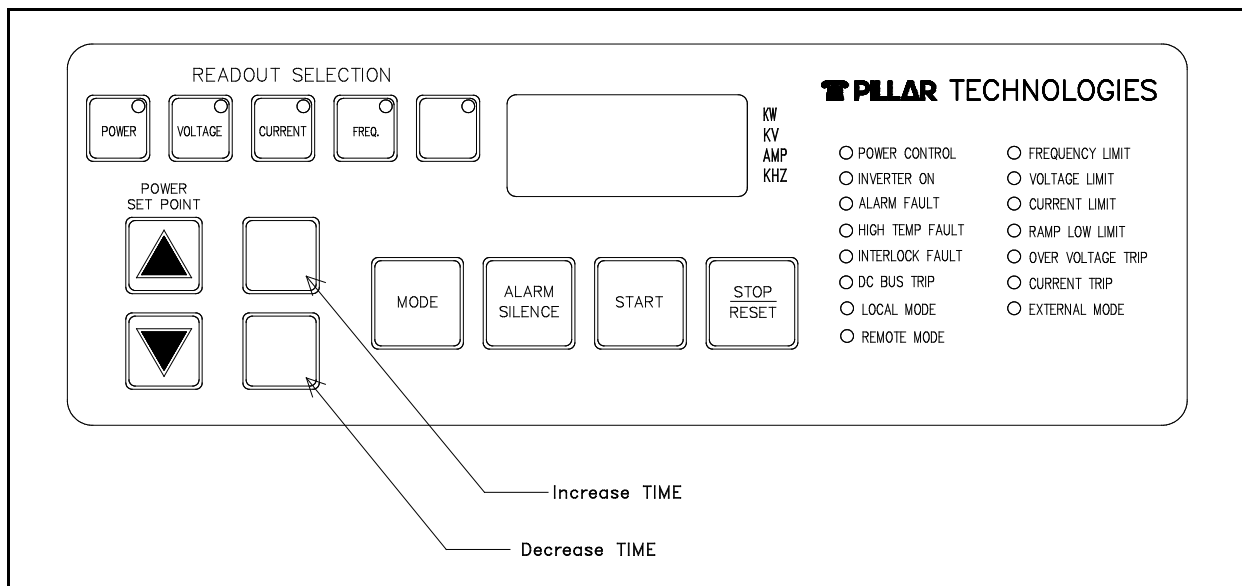


Figure 2 – Humidity Compensation Time

Optional Equipment

Listed below are the various optional items available for the Narrow Web Treating system.

Proportional Speed - An optional sensing system is provided, fiber optic sensors are connected to amplifiers inside the power supply enclosure. The pulsed output from these amplifiers is then connected to additional control circuitry, which controls the power supply output in proportion to the ground roll speed.

To select this mode of operation, press the MODE button on the operator panel; the operator panel EXTERNAL MODE LED will light to indicate that this mode has been selected.

To adjust the proportional speed, operate the equipment at the desired maximum line speed. Use the Power Set Point UP or DOWN buttons on the display panel to adjust for the desired power level. The

power level will now ramp from zero up to the desired power level but not greater than the maximum power rating of the system.

Computer Interface – An analog input from a customer supplied signal controls the power level of the system while an external buffered analog output is provided to monitor the level of power delivered.

Watt Density – An independent sensing system which monitors the speed of the treater roll, and uses this information along with the electrode width constant entered at the factory to control the power level by entering a watt density number. As the line speed changes the internal circuitry will automatically adjust the power to maintain the requested watt density. Watt Density is measured in watts per square foot per minute.

To select this mode, press the MODE button on the display panel. The display panel EXTERNAL MODE light should come on. To adjust the Watt Density level, use the Power Set Point UP and DOWN buttons on the display panel. The units will be shown in Watt - Minutes per foot squared.

Remote Control Station – A separate enclosure with the operator display panel mounted into it. The Remote Control Station has a mounting flange with four, 0.31 diameter mounting holes, suitable for mounting on a wall or panel. The unit weighs 21 lbs. (0.95 kg). Refer to the printed material furnished with the Remote Control Station and the system interconnect diagram for details on installation and set up.

The remote operator panel is identical in appearance and operation to the local operator panel on the power supply. It also includes a Corona Manual Stop button, which is identical to the Corona Manual Stop button on the power supply.

The remote operator panel is a slave to the local operator panel. It provides information to the power supply upon request, and displays information from the local operator panel.

The Corona Manual Stop buttons on both the local AND remote operator panels must be pulled out to turn on the remote control station and enable corona. Pushing in either of these buttons will manually inhibit the power supply, and also remove power from both the remote and local operator panels. The remote Corona Manual Stop button lights when power is supplied from the power supply (the power supply is powered AND its Corona Manual Stop button is pulled out), to indicate that corona is manually inhibited by the remote control station. Note that the Corona Manual Stop button, which is actually inhibiting the corona, is the one, which will be lighted.

The three-digit LED display displays the output power, voltage, current, or frequency. Lights on the READOUT SELECTION buttons indicate the displayed output. The displayed parameter may be selected independently of the local display, regardless of which operating MODE is selected, with the READOUT SELECTION buttons.

The operating mode, fault, alarm, and limit status indications will be identical to the indications on the local operator panel.

The remote operator panel can only be used to control the POWER SET POINT UP/DOWN arrows when REMOTE MODE is selected and the START button only when REMOTE or EXTERNAL MODE is selected. If the POWER SET POINT UP or DOWN button is pressed when the power supply is not ON, the Power Set Point in kW is displayed while the button is held down. When the button is released, the set

point will be displayed for a short time up to one second, then will display the actual power. If the power supply is ON, the actual power will be displayed even while the POWER SET POINT UP or DOWN button is pressed.

The MODE is selected by pressing the MODE button on either the remote or local panel. The selected (and displayed) mode advances from LOCAL to REMOTE to EXTERNAL (if EXTERNAL mode is available) and back to LOCAL each time a MODE button is pressed on either operator panel. The displayed MODE will be the same on both panels.

The STOP/RESET and ALARM SILENCE are operational regardless of which MODE is selected and operate identical to the local operator panel. The STOP/RESET button turns off the power supply inverter and resets any alarm/fault conditions. The ALARM SILENCE button causes the LTI relay contact to remain open even if an LTI fault has occurred.

Spare Parts Kit – A supply of pre selected components which can be used when troubleshooting the equipment or for periodic maintenance.

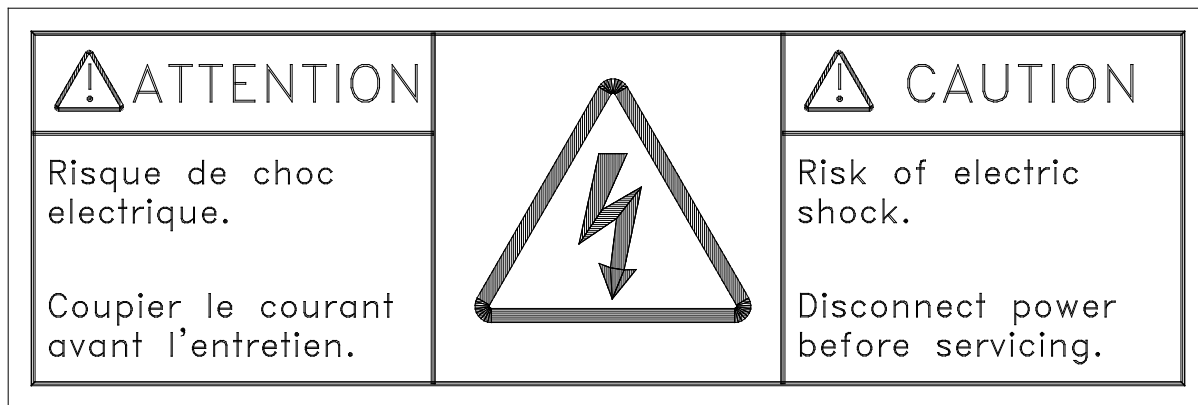
Input Transformer – Line matching transformer for use when 240 VAC mains are not available. This optional transformer, when furnished, may be mounted in any convenient location, which allows for adequate air flow and service clearance around the transformer. A minimum of (1) one-foot (0,3 m) of clearance is required around all sides of the cabinet to allow for adequate ventilation and cooling. Service clearance will be predicated by the need to comply with local, State and Federal electrical codes such as N.F.P.A. 70. The transformers are designed to operate in ambient temperatures up to 40°C (104°F) maximum. Operation in temperatures exceeding 40°C (104°F) may cause premature failure of the transformer and possible damage to other components.

Start-up

- This is a simple walk-through on getting the inverter ready to run. It is assumed that all the installation parameters and line speed calibration have been completed.
- When power is first applied to the unit and the Corona Manual Stop button is pulled, the operator panel defaults to Power display.
- Choose the appropriate readout selection mode and enter the desired power level and any other parameters that are requested.
- If the unit is configured for auto-start, press the START key. The inverter will not run until the Auto Start contact closes. Otherwise start the process machinery and get the web moving before pressing the START key.
- Normal operation is indicated when the green POWER CONTROL and INVERTER ON LED's are lit.
- To turn the inverter off, press STOP. The unit will automatically stop if the line speed drops below the minimum and opens the interlock circuit. If Auto Start is used, the inverter will automatically restart when the Auto Start contact closes.
- To adjust the zero speed set point, operate the line speed at the level that you wish the power

supply to turn off. (To protect the web and roll). This point is normally factory set at 10% of maximum line speed. Hold down the ALARM SILENCE and STOP/RESET buttons simultaneously. The frequency of the speed sensor will be displayed for several seconds and the zero speed will now be set. Note that on a two side treat system, only one roll has a roll speed sensor.

6000 Maintenance

Wire Number Reference

The number references listed below represent the typical wire connections that are used on the Unitized Narrow Web. Please consult the interconnect drawings provided with your system for additional wiring information.

- 501, 502 – Treater station interlock circuit.
- 601, 602, 603 – Speed signal for zero speed interlock and Optional Proportional Speed Control
- 607, 608 – Computer interface set point. (Optional)
- 609, 610 – Computer interface power level feedback. (Optional)
- 801, 802 – Auto start contact
- 803, 804, 805 – Loss of Treatment/Over Treatment Alarm
- 806, 807 – Inverter Run Contact
- 1181, 1191 – Auxiliary Stop
- 1201, 1211 – Auxiliary Start
- 1221, 1231 – Electrode B Power limit signal.
- 1241, 1251 – Electrode A Power limit signal.
- 1330, 1331 – Speed reference output.

External Interfaces

All of the external interfaces described below are via DIN rail mounted terminal block TB1, located on the component panel of the power supply cabinet.

<u>Signal Name</u>	<u>Terminal Block Connections</u>	<u>Description</u>
External Interlocks	TB1-501 through TB-506	24 VDC relay coil circuit from TB1-501 to TB1-506 must be closed by a contact closure to enable the power supply inverter to be turned on. 6 terminals from TB1-502 to TB1-506 may be "daisy chained".
Auto Start	TB1-801 to TB1-802	Selectable internal or external auto start. Closure of wires 801 & 802 will start the inverter when zero speed is satisfied. If Auto Start is not used, a jumper must connect TB1-801 to TB1-802.
Loss of Treatment/Over Treatment Indicator	TB1-803 to TB1-804	Normally open relay contact closes Wire #'s 803 and 804 when the desired power is being delivered to the load.
	TB1-804 to TB1-805	Normally closed relay contact opens Wire #'s 804 and 805 when the desired power is being delivered to the load.
Inverter Run Contact	TB1-806 to TB1-807	Normally closed relay contact closes Wire #'s 806 and 807 when the power supply inverter is on.

Computer Interface Set-point

	TB1-607 (+) to TB1-608 (-)	0 to 10VDC (voltage mode) or 4 to 20 ma (current mode) power set-point input, 10V (20 ma) correspond to max power & 0V (4 ma) correspond to zero power.
Computer Interface Feedback	TB1-609 (+) to TB1-610 (-)	0 to 10 VDC/4-20 ma isolated Power Feedback signal 10V/20mA=100% of rated power, depending on whether voltage or current mode is installed.
Auxiliary Start	TB1-1201 to TB1-1211	Momentary closure of wires 1201 & 1211 will start inverter. If SW1 dip switch 7 on display board is enabled, a maintained closure is required.
Auxiliary Stop	TB1-1181 to TB1-1191	Momentary closure of wires 1181 & 1191 will stop inverter.
Electrode A Enable Electrode B Enable	TB1-1241 to TB1-1251 TB1-1221 to TB1-1231	Prevents over powering electrodes during high voltage switching applications. Terminal jumpers are required to achieve full power.
Speed Reference Output	TB1-1331(+) to TB1-1330(-)	Open collector output, which provides an auxiliary speed reference for multiple power supply applications.

Display Board Potentiometers (CB10205)

P1 - Frequency Gain	P2 - Power Gain	P3 - Power Set Point Gain
P4 - Voltage Gain	P5 - Current Gain	

Note: Frequency, Voltage and Current Gain are not standard and therefore are not populated on CB10205-3 unless purchased as optional equipment.

DIP Switch Functions SW1 on CB10205-3 ("1" or "ON" means the switch is closed)

LOCAL		REMOTE	
1 - Local Enable	5 – Constant HCC Enable	1 - Remote Enable	5 - Not Used
2 - External Enable	6 – Prop Spd./ CI Enable	2 - Not Used	6 - Not Used
3 – Watt Density Enable	7 – PLC Run Enable	3 - Not Used	7 - Not Used
4 – Auto Trip Enable	8 – Zero Speed Enable	4 – Not Used	8 – Not Used

Adjustments

Internal potentiometers are preset at the factory and should only be adjusted by trained service personal.

Display Board Adjustments - Computer Interface Option

<u>Function</u>	<u>Jumper Setting</u>
4-20 ma Current Output:	JP1 in position 2-3
0-10V Voltage Output:	JP1 in position 1-2
4-20 ma Current Input:	Isolation Module on Din Rail
0-10V Voltage Input:	Isolation Module on Din Rail

Display Board Adjustments - Proportional Speed Control Option

Proportional Speed Control causes the power supply output to be proportional to treater station roll speed. The treater station with Proportional Speed Control includes a fiber optic sensor whose output frequency is proportional to the treater roll speed. The proportional speed function is normally factory adjusted for optimum match between the power supply and treater station, so no adjustments should be required. If fine adjustment is required, the treater station must be connected to the power supply in accordance with the System Interconnect Diagram before attempting any adjustments.

Select EXTERNAL mode on the power supply front panel. Operate the equipment at desired line speed. Set the desired power using the operator panel power set point buttons. Turn on the power supply by pressing the START button. The actual power displayed on the operator panel should agree with the preset power level. The output power will now ramp from zero up to the desired power level but not greater than the maximum power rating of the system.

Watt Density Adjustment

To select this mode, press the MODE button on the display panel. The display panel EXTERNAL MODE light should come on. To adjust the Watt Density level, use the Power Set Point UP and DOWN buttons on the display panel. The units will be shown in Watt - Minutes per foot squared.

Zero Speed Adjustment

Operate the line speed at the level that you wish the power supply to turn off and protect the web and roll. This point is normally factory set at 10% of maximum line speed. Hold down the ALARM SILENCE and STOP/RESET buttons simultaneously. The frequency of the speed sensor will be displayed for

several seconds and the zero speed will now be set. Note that on a two side treat system, only one roll has a roll speed sensor.

Impedance Matching

Taps have been provided on the high voltage transformer primary to match the impedance of the corona bar to the power supply. The lower voltage taps reflect higher current and lower voltage to the power supply. Always start at the highest voltage tap (X4-X0) when first starting the treater on line and whenever a major change is made to the treating station. Utilize the tap setting in which the required power output is achieved, while being at 80 - 100% on output volts.

Symptom: Low current, voltage or frequency limit, low kW:

Change to the next lower primary tap (e.g. change from X4 - X0 to X3 - X0)

Symptom: High Current, low voltage, low kW:

Change to the next higher primary tap (e.g. change from X1 - X0 to X2 - X0)

Power Supply Inspection

Maintenance is limited to keeping the front panel and fan filters clean. Use a soft cloth and window cleaner or mild detergent to clean the front panel. *Do not use solvent.* Solvent will damage the plastic panel overlay. The fan filter located on the supply's right hand side should be cleaned with plant air or vacuum occasionally. Disconnect incoming power before cleaning.

Operational Indicators

- *Kilowatt-hours* – The BLANK button next to the frequency display button is being used for kilowatt-hour indication. Pressing this button will display the number of accumulated kilowatt-hours on the machine when in the run condition. If you want to reset the number of accumulated hours back to zero, you need to hold the BLANK button for a few seconds until the display shows zero.
- *Run Time hours* – The number of clock hours that the machine is operated is recorded by the microprocessor and can be viewed on the display. To view the accumulated hours you need to press the ALARM/SILENCE button and the BLANK button next to the frequency selection button simultaneously.
- *Sensor Frequency Monitor* – The frequency signal received from the inductive or optical speed sensor can be display on the operator panel to aid in setup and maintenance. To view the frequency you need to press the ALARM/SILENCE and the FREQUENCY button simultaneously.

Error Indications

During operation, certain aspects of the inverter and treater station are monitored. Problems that might arise will be reported on the display panel. Some or all problems will result in the closing of the Loss of Treatment alarm relay. The customer can connect a visual or audible signal to this relay.

Faults - A fault is a condition where the inverter is shut down. The FAULT conditions are indicated by yellow lights on the operator panel to assist in fault diagnosis. The faults indicated are:

High Temp Fault	Inverter heatsink temperature limit exceeded. May indicate cooling fan failure or blocked ventilation ducts.
Over Voltage Trip	Excessive power supply output voltage detected. May indicate incorrect high voltage transformer tap selection or arcing in the treater station.
Current Trip	Excessive power supply current detected. May indicate incorrect high voltage transformer tap selection, high voltage breakdown in the treater station, or roll covering failure.
DC Bus Trip	Bus over-voltage or under-voltage detected. May indicate excessive voltage on input mains or low or missing phase.
Interlock Fault	Loss of external interlock or internal zero speed condition detected. May indicate that a treater station fault occurred, which may include an exhaust blower failure, and electrode positioning error, the opening of an enclosure door or activation of an emergency stop.

Warnings - A warning condition is not a result of a component failure, but rather a situation where the inverter has reached its maximum capacity. The warning conditions are indicated by yellow lights on the operator panel. The warnings indicated are:

- Frequency Limit The inverter is operating at maximum frequency.
- Voltage Limit The power supply is delivering maximum voltage.
- Current Limit The power supply is delivering maximum current

Specifications

- Available power ratings: 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0 and 3.5 kW
- Digital Display displays actual rated power, voltage, current or frequency. The displayed parameter is indicated next to the readout.
- Power set point displayed prior to turning on the inverter, when the POWER SET POINT buttons are activated.
- User Interfaces:
 - Auto Start
 - Loss of Treatment Indicator (LTI)
 - Power control input - 0 to 10 V or 4 to 20 ma (Sold as an option)
 - Power status output 0 to 10 V or 4 to 20 ma (corresponds to 0 to 100% of rated power) (Sold as an option)
- Operating status indicators:
 - INVERTER ON** - indicates the inverter is on. When flashing, it indicates that the auto start function is enabled and the inverter is ready to turn on when the line speed reaches the zero speed set point.
 - POWER CONTROL** - indicates the power is running in normal power control mode.
- Fault status by yellow status lights:
 - ALARM FAULT** - indicates power deviates from selected power by more than +/- 5% of full scale power and LTI has been activated.
 - HIGH TEMP FAULT** - indicates inverter heatsink over temperature, possible insufficient cabinet ventilation.
 - OVER VOLTAGE TRIP** - indicates excess output voltage, possible load mismatch.
 - CURRENT TRIP** - indicates excessive inverter current, possible inverter failure.
 - DC BUS TRIP** - indicates insufficient DC bus voltage, possible phase loss on AC mains, or excessive DC bus voltage.
 - INTERLOCK FAULT** - indicates inverter operation is inhibited by external interlock not closed.
- Warning status by yellow status lights:
 - FREQUENCY LIMIT** - indicates output is being limited by inverter frequency.
 - VOLTAGE LIMIT** - indicates output is being limited by output voltage.

CURRENT LIMIT - indicates output is being limited by output current

Table 1 - Input Power Requirements

INPUT VOLTAGE +/- 10%, 50/60	POWER SUPPLY RATED POWER	INPUT KVA	PHASE	AC MAINS AMPS	AC MAINS WIRE AWG (90° C)
240	0.5	.67	1	2.8	12
240	0.75	1.0	1	4.2	12
240	1.0	1.3	1	5.4	12
240	1.5	2.0	1	8.3	12
240	2.0	2.6	1	10.8	12
240	2.5	3.3	1	13.5	12
240	3.0	4.0	1	16.5	12
240	3.5	4.7	3	11.2	12

- Ambient temperature 0 to 40° C (32 to 104° F) allow unrestricted airflow to the power supply cabinet air inlets, outlets and to the entire high voltage transformer tank for convection cooling
- Humidity 20% to 90% non-condensing
- Power display accuracy - +/- 3% of full-scale
- Frequency, voltage and current display accuracy - +/- 10% of full scale
- Output frequency range 0.5 to 25 kHz (maximum frequency operation occurs at max delivered power)
- High voltage transformer taps - 4 primary tap selections (X0, X1, X2, X3 and X4)
- Computer Interfaces (Optional): Input 0 to 10V DC or 4 to 20 ma DC corresponds to 0 to 100% of rated power. Output 0 to 10V DC or 4 to 20 ma DC corresponds to 0 to 100% of rated power.
- Proportional Speed Power Control (Optional): Power Supply power output is proportional to the treater station roll speed.

Service

MAINTENANCE

Maintenance is limited to keeping the front panel and fan filters clean. Use a soft cloth and window cleaner or mild detergent to clean the front panel. *Do not use solvent.* Solvent will damage the plastic

panel overlay. The fan filter located on the supply's right hand side should be cleaned with plant air or vacuum occasionally. Disconnect incoming power before cleaning. There are no other items requiring maintenance on the power supply.

TROUBLESHOOTING

- The Fault and Warning indications provide diagnostic information for trouble shooting the equipment. Note the indications, which are lit, and the conditions under which they occur when contacting Corona Supplies Service Department.
-
-
-
-

Section 10

MACHINERY SAFETY



1. Corona treatment equipment operates at very high voltages (up to 15000 volts) at electrodes. It is essential that the utmost caution is taken when operation and maintaining equipment, where dangerous voltages are present they are indicated by the hazardous voltage warning label ISO 3864 No. B.3.6.
No access is permitted to the area indicated by this symbol **UNLESS** the power supply is isolated.



2. The treatment process produces ozone gas as a by product. It is the customer's responsibility to ensure that the unit is connected to a suitable extraction system and or catalytic converter constructed from corrosion resistant materials.
Ozone extraction outlets are identified by the above label.
(See Appendix 1.)



3. The Generator is equipped with a dust filtration system indicated by the caution symbol ISO 3864 No B.3.1 symbol. If this system blocks see routine maintenance section, as the unit may overheat
4. When isolating the Generator supply a small time delay of <5 seconds is needed for power to drain from capacitors via leakage resistors. Service engineers opening the doors should be aware of this.
5. Care must be taken to avoid injury from moving parts, such as rotating rolls, moving electrode assemblies and sensor probes at roll ends. Where risk is considered high guards are fitted.
6. Some machines are designed to be 'open' construction. It is the customer's responsibility to ensure access is safe. Fence type guards or other protection can be ordered separately at order placement or subsequently.

NB Corona Supplies cannot specify guarding of interfaces between their machinery and the machinery into which it is to be incorporated because of the unique requirements of each installation. Therefore, Corona Supplies have supplied machinery with residual mechanical and electrical risks which must be safe-guarded by the user. Access to Corona Supplies machinery must be prevented at all times when the HT electrodes are energised.



11 Ozone: Health Hazards and Precautionary Methods

Guidance Note EH38 from the
Health and Safety Executive

OZONE : Health Hazards and Precautionary Measures

Environmental Hygiene Series 38 (July 1983)

These Guidance Notes are published under five subject headings: Medical, Environmental Hygiene, Chemical Safety, Plant and Machinery and General.

INTRODUCTION

1. This guidance note contains information on the principal hazards to health from ozone and on potential sources of exposure. General advice on precautionary measures, control techniques and legal requirements is given.
2. Ozone, O₃, is a toxic gas possessing a distinctive odour and is a normal constituent of the earth's atmosphere. Ozone is produced deliberately for a variety of industrial purposes and is also produced naturally from oxygen whenever ultra-violet radiation or electrical discharges occur, e.g. at high altitudes or by the action of lightning. Such natural occurrence is unlikely to produce concentrations hazardous to man.
3. Because of its strong tendency to decompose and to release oxygen, ozone is extremely reactive and is a powerful oxidising agent which reacts explosively with oil and grease. Nevertheless it can be used with safety in industry. For example, since it readily oxidises organic matter, it is used as a bactericide and algacide.
4. Ozone itself is a distinctly blue coloured gas (bp – 111.9°C) and is about one and a half times heavier than air (density 2.144g/l). Ozone is used as "ozonised air", a colourless gas produced when ozone is generated from part of the oxygen in air (see para 13). Ozone cannot be stored or transported in vessels because it decomposes spontaneously in the presence of oxidisable impurities, humidity and solid surfaces. The rate of decomposition increases with temperature.
5. Background concentrations in our immediate atmosphere vary as a function of season, weather conditions, altitude and humidity

EFFECTS OF OZONE

6. Low concentrations of ozone have a significant effect upon textiles, fabrics, organic dyes, metals, plastics and paints and cause the characteristic cracking of stressed rubber, commonly called "weathering". A few substances, however, are resistant to the oxidising effect of ozone and these include glass and some stainless steels.

7. The acute toxicity of ozone to man has long been recognised and is well documented¹⁻⁸. The symptomatic and clinical effects of ozone at various concentrations are summarised in Table 1. Ozone is irritant to mucous membranes of eyes and respirator tract, and high concentrations can cause pulmonary oedema.

8. It is possible that there are secondary sites of reaction to ozone characterised by a defect in oxygen dissociation from oxyhaemoglobin in the tissues. Even at an exposure level of 0.1ppm ozone, premature ageing may result in man if exposure is sufficiently prolonged.

EXPOSURE LIMITS

9. The Health and Safety at work etc Act 1974 requires every employer to ensure, so far as is reasonably practicable, the health of all his employees and others who may be affected by the work he undertakes. The Act also places duties in respect of health and safety matters on the self-employed. The Factories Act 1961 requires factory occupiers to take all practicable measures to protect employed persons against inhalation of fume. The general policy adopted by the Health and Safety Executive is that exposure to hazardous substances should be kept at low as is reasonably practicable and in any case exposure should be kept within published standards by the application of engineering controls or other suitable control techniques. The Health and Safety Executive publishes, in guidance notes in the RH series, information on exposure limits applied in the UK.

10. The recommended exposure limit for ozone is 0.1ppm (0.2mg/m³) calculated as an 8-hour time-weighted average concentration. There is also a short-term exposure limit for ozone of 0.3ppm (0.6mg/m³) calculated as a 15-minute time-weighted average concentration.

SOURCES OF EXPOSURE

11. Ozone is made using ultra-violet radiation or electrical discharge either intentionally for the purpose of a specific process or incidentally to a process. It is an unstable substance but its rate of decomposition varies widely according to temperature and humidity. A given ozone output yielding a faint trace of ozone in a workroom atmosphere on a humid day may create an undesirable concentration on a dry day.

INTENTIONAL PRODUCTION

12. Ozone is usually produced intentionally by silent electrical discharge in air. Alternative means of production such as bombardment of air with ultra-violet or ionising radiation, or electrolysis of cooled sulphuric acid, are uncommon in practice.

13. There are basically three types of ozone generator in use, working at:

- (a) Atmospheric pressure – typically a box through which material to be treated with ozone is passed, and in which a silent electrical discharge is initiated through the air by means of metal electrodes. This system is often used for surface treatment of plastic film.

- (b) Reduced pressure – found in swimming pool disinfection plants whereby dried air is drawn through glass tubes across which a silent electrical discharge is struck. The reduced pressure is generated by a sidestream from the circulating pool water forming a venturi vacuum.
- (c) Positive pressure – found in potable water treatment plants and throughout industry generally. Dried air is blown through glass tubes across which a silent electrical discharge is struck and this ozonised air emerges at positive pressure.

14. The processes for which ozone is produced are outlined below.

SURFACE TREATMENT

15. Various industries which manufacture or use plastic packaging in its various forms use ozone to pre-treat the plastic surface immediately before printing.

ELECTRICAL DISCHARGES

16. Ozone is generally produced around high voltage equipment and by electrical discharges in specific processes e.g.

- (a) Arc welding – reactive metals such as aluminium and titanium, and also stainless steel are arc welded in an inert shield of argon or carbon dioxide. The intense radiation from the arc produces significant quantities of ozone.
- (b) Static eliminators are often used in industry to remove static electricity from recently moulded plastic articles, and continuous use of them in a poorly ventilated room could lead to the build-up of an irritating level of ozone above the recommended exposure limit. The main factor which determines the amount of ozone produced is the voltage across the collector plates; the higher the voltage the more ozone is produced.
- (c) Electrostatic precipitators are used to remove dust and some airborne contaminants from the air and they produce ozone also. More ozone is produced if there are rough or sharp edges on, for example, new metal parts since intense local voltage gradients are produced.

VENTILATION

17. Areas into which ozone may escape must be equipped with adequate ventilation and extraction facilities. In ozone plant rooms, it is recommended that ten changes of room air per hour be achieved to enable dangerous accumulations of gas to be dispersed within a few minutes.

18. Ozone should be prevented from entering the workroom air by the use of exhaust appliances placed close to the source of emission. The ozone may then be passed through appropriate filters before discharge to a safe place in the open air. In the case of ozonators operating under negative pressure, the process acts as its own exhaust ventilator. In the case of atmospheric pressure ozonators, effective local exhaust ventilation is necessary because the ozonators are not enclosed. Cinema projection lamps should present no ozone hazard provided adequate mechanical exhaust ventilation is fitted to the lamp housing and the exhausted air is vented to a safe place. Many processes incidentally producing ozone (e.g. welding, ultra-violet curing inks) will have some ventilation provided to deal with other problems from process.

SAFE SYSTEMS OF WORK

19. In order to ensure that plant and processes are properly operated and controlled to minimise risk to health, satisfactory safe systems of work need to be established and maintained by means of appropriate training and supervision.
20. All people operating ozone plant should be given full training in all aspects of the operation of the ozonator and associated equipment and should be trained in emergency and first aid procedures. Emergency action plans should be prepared for all sites where ozone is generated deliberately in potentially hazardous quantities.
21. Special care may be required when opening sealed plant for maintenance purposes. Guidance Note GS5¹⁰ should be consulted for detailed advice on permit-to-work systems and precautions on entry into confined spaces.
22. Work on ozone plant should only be undertaken by a person specifically authorised to do the work. Such a person should be trained and be competent to do the work in a safe manner. When carrying out repairs or maintenance work on an ozonator, the ozonator transformer must be isolated and locked off, and a permit to work must be issued, to avoid risks from ozone and from electrical hazard.
23. The cleaning materials used for cleaning ozone units and pipework must be free from oil or grease.
24. In the event of an ozone leak a plant restart should not be attempted until the source of leakage has been investigated and rectified. Leak detection by nose is not satisfactory because even slight leaks cause the sense of smell to be numbed and lead to the false conclusion that a leak no longer exists.
25. Appropriate warning signs indicating the presence of a potential toxic gas hazard should be displayed on ozone plant access doors or in passageways leading to the plant room.

MONITORING

26. Ozone detectors may be used to provide audible and visual warnings of ozone leaks. Such alarm signals may be used to initiate emergency procedures, or to automatically turn on plant room ventilation and shut down the ozonator. Ozone-in-air monitors are essential in plant rooms where ozonators and associated equipment operate under positive pressure, because of the greater risk of ozone leakage outward. The monitors in such situations should actuate automatic ozonator shut down at 0.3ppm ozone or less, while actuating warning alarms at 0.1ppm or less.
27. Minor ozone leaks can be detected and located by means of moist starch/potassium iodide paper which turns blue on exposure to ozone.
28. It is essential to carry out regular testing and calibration of all sensor equipment used.

EXHAUST EMISSION

29. Process gas venting to atmosphere should pass through an ozone destructor device or be released in such a way as to present no hazard. A destructor is a catalyst filter or other device which causes ozone to decompose in a controlled manner to oxygen. Provided the discharge point allows adequate dilution a destructor device may not be necessary. If a catalyst bed, for example activated carbon, is used as an ozone destructor it is possible that the bed could become exhausted during a period of operation and this should be borne in mind when arranging maintenance schedules.

30. Deflection weather caps are not recommended for discharge stacks since these hinder dispersal. Vertical discharge stacks are recommended with a discharge velocity of 15-20m/s to aid dispersal and avoid re-circulation into buildings. Stacks and extraction vents should be carefully sited so that they do not feed fresh air ventilation intakes.

31. The control of ozone input to a process is crucial since excess ozone can lead to high levels of vented ozone.

32. Activated carbon filters must under no circumstances be exposed to ozone concentrations higher than 20g/m³ since the reaction may become auto-accelerated and lead to an explosion. The automatic shutdown is a safeguard against this risk.

FIRST AID

33. If a person is overcome by ozone, the following precautions should be adopted:

- (a) Remove the patient to a warm uncontaminated atmosphere and loosen tight clothing at the neck and waist.
- (b) Keep the patient at rest.
- (c) If the patient has difficulty in breathing, oxygen may be administered provided that a suitable apparatus and a trained operator are available.
- (d) If breathing is weak or has ceased, artificial respiration should be started. The mouth-to-mouth or mouth-to-nose methods are preferred.
- (e) Seek medical aid.

34. Ozone poisoning should be treated symptomatically. This may include bed rest, analgesics to relieve pain, and antibiotics as may be prescribed by a medical practitioner.

SAMPLING AND ANALYTICAL METHODS

35. Sampling strategies to monitor the extent of exposure to ozone or to assess compliance with exposure limits should be carefully planned and the advice of an occupational hygienist may prove useful. Short-term sampling may be used to identify peak exposures and to assist in the prevention of acute gassing incidents. It may not be valid, however, to use the results of such sampling for the determination of time-weighted average long-term exposures. Personal atmospheric sampling is to be recommended when assessing the actual pattern and duration of exposure. (Further information is contained in Health and Safety Executive guidance notes on Exposure Limits).

36. The traditional method of determining ozone in air may be used¹² but continuous ozone monitors are now available which use a variety of techniques including chemiluminescence, ultra-violet photometry and electro-chemical cells. Relatively inexpensive gas detector tubes are also available. These are ideal for spot check, provided that interfering gases, such as oxidising agents, are known to be absent.

STATUTORY REQUIREMENTS

37. The general duties of employers, the self-employed, manufacturers, suppliers and of employees at work are contained in the Health and Safety at Work etc Act 1974. Other relevant statutory provisions include the Factories Act 1961, the Offices, Shops and a Railway Premises Act 1963 and the various regulations and orders made under these Acts. The following is a brief summary of the principal requirements with regard to potential ozone health risks:

(a) Health and Safety at work etc Act 1974

- s.2 & 3 general duties of employers and the self-employed
- s.6 general duties of manufacturers
- s.7 general duties of employees

(b) Factories Act 1961

- s.4 provision of ventilation
- s.30 dangerous fumes
- s.63 removal of dust of fumes

(c) Offices, Shops and Railway Premises Act 1963

- s.7 provision of ventilation

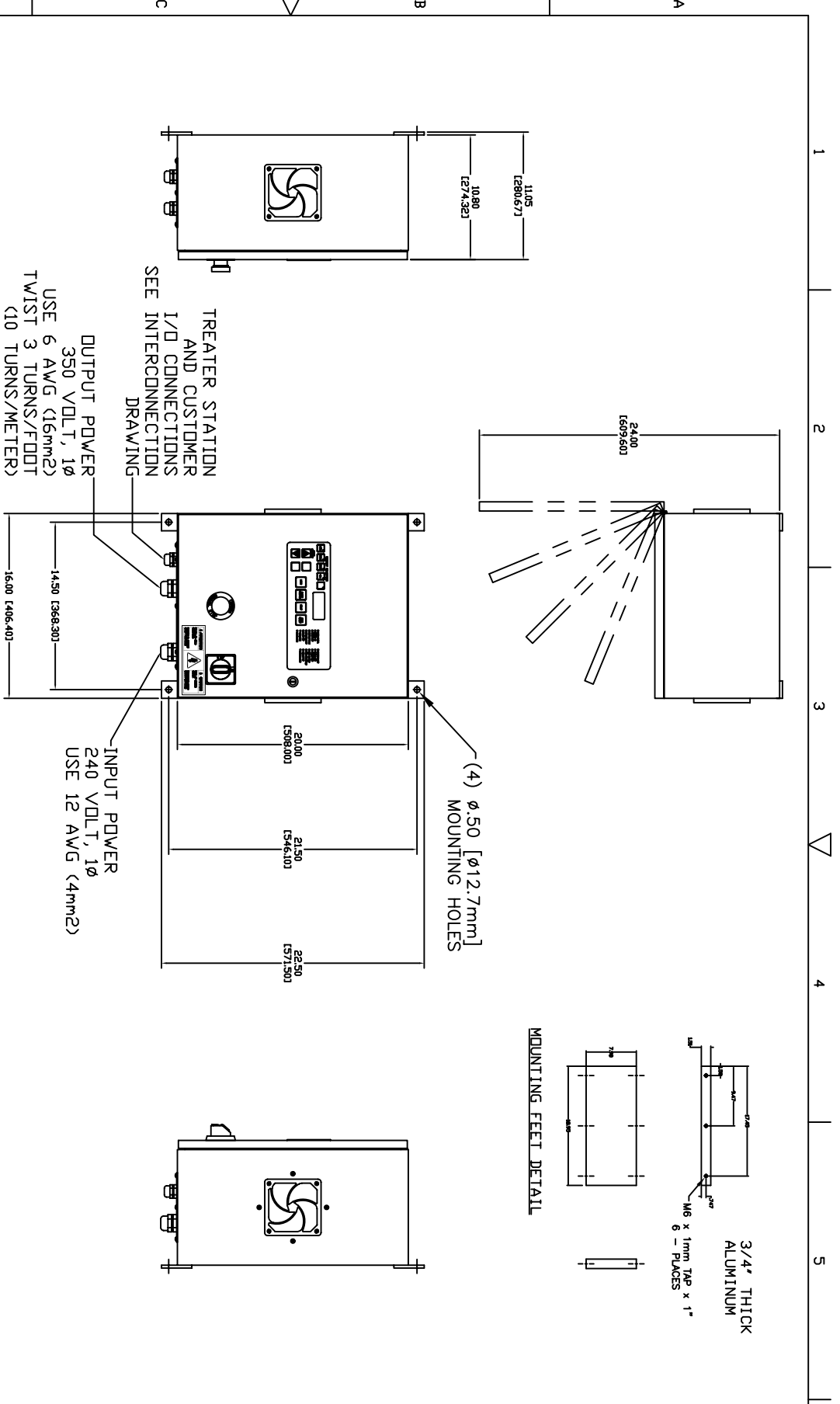
(d) The Shipbuilding and Ship-Repairing Regulations 1960 – Regulation 53

- The Iron & Steel Foundries Regulations 1953 – Regulation 7
- The Non-Ferrous Metals (Smelting and Founding) Regulations 1962 – Regulation 11
- The Electricity (Factories Act) Special Regulations 1944
- The Notification of Accidents and Dangerous Occurrences Regulations 1980
- The Health and Safety (First Aid) Regulations 1981.

SECTION 12

Corona Treater Station
Parts List

(If Applicable)



THIRD ANGLE PROJECTION
DO NOT SCALE
IF IN DOUBT ASK

1	PROD. ISSUE
	01-06-08
ISS. DESCRIPTION & DATE	
MODIFICATIONS	

APP'D	DRAWN <i>B. R. Carter</i>	MATERIAL	TOLERANCES UNLESS OTHERWISE STATED	UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN MILLIMETRES
DATE	DATE 01-06-08		TO 0 DEC. PLACE 0.4 (.015") TO 1 DEC. PLACE #0.2 (.008") 2 DEC. PLACES #0.1 (.004") HOLE DIAS. + 0.15 - 0 (.006"-0) ANGLES \pm 1'	SURFACE FINISH 1.6um REMOVE ALL BURS & SHARP EDGES TO 0.25 RADIUS DR CHAMFER
TRACED	CHECKED	FINISH	DIM'S. APPLY AFTER PLATING	SCALE <i>N/A</i>
DATE	DATE			

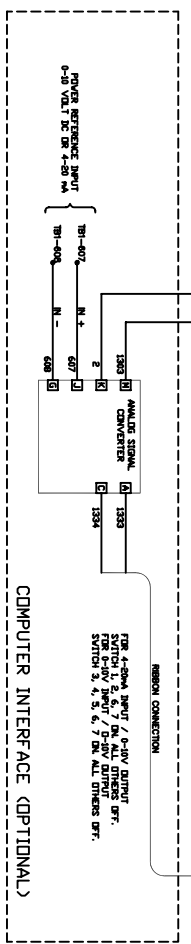
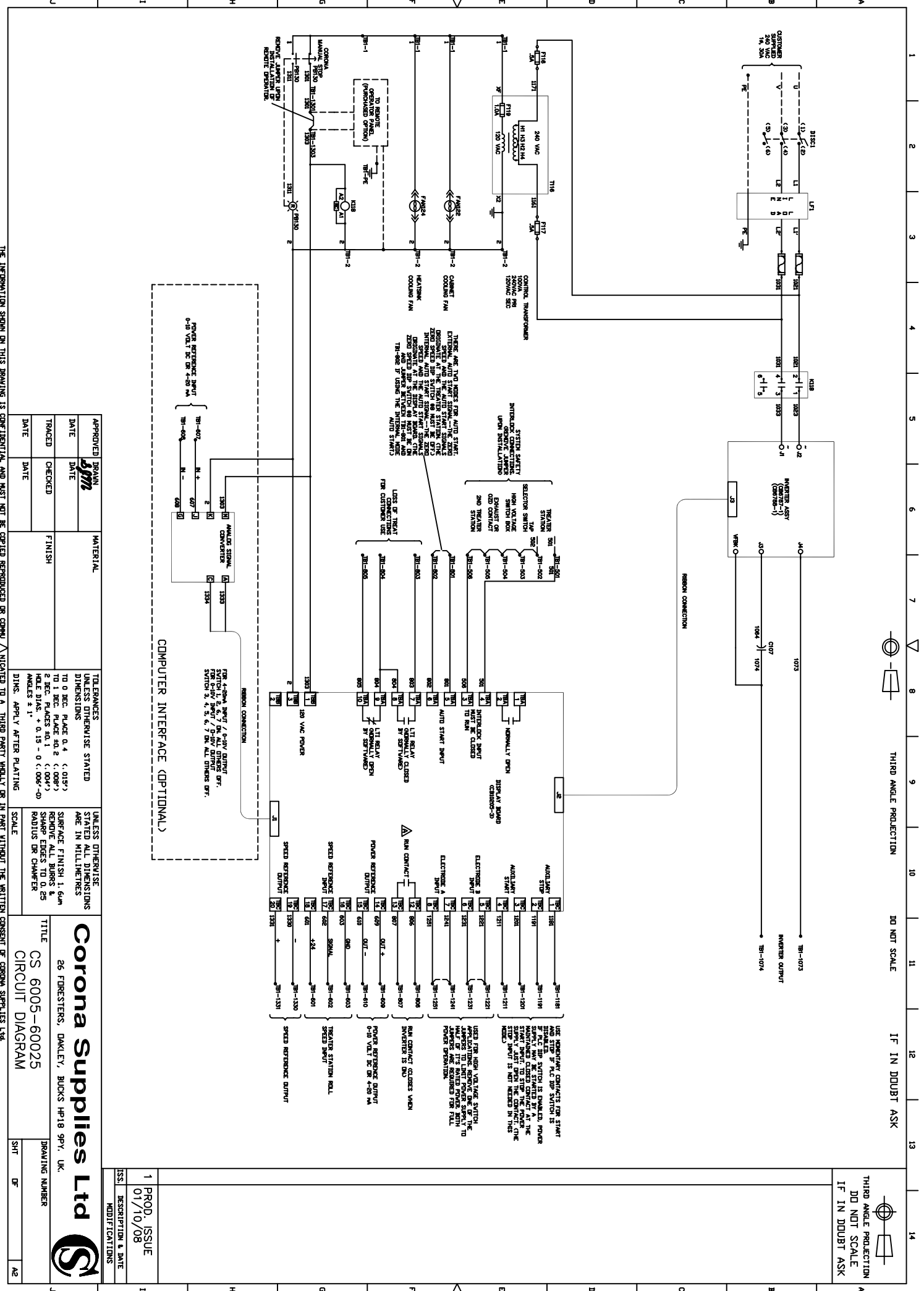
Corona Supplies Ltd
26 FORESTERS, DAKLEY, BUCKS. HP18 9PY. UK

EP 6000 Generator

DRAWING NUMBER

SHT DF A4

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APPROVED	DATE	MATERIAL	TOLERANCES UNLESS OTHERWISE STATED DIMENSIONS ARE IN MILLIMETRES	UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN MILLIMETRES
<i>Jynn</i>			TO 0 DEC. PLACE 0.4 (0.0157)	SURFACE FINISH 1.6um
			TO 1 DEC. PLACE 0.2 (0.0079)	REMOVE ALL BURGERS & SHARP EDGES TO 0.25
			TO 2 DEC. PLACE 0.1 (0.004)	RADIUS OR CHAMFER
			HOLE DIAS. + 0.15 - 0 (0.006 - 0)	
			ANGLES ± 1°	
			DIMS. APPLY AFTER PLATING	
DATE	DATE	DATE	SCALE	

Corona Supplies Ltd
 26 FORESTERS, DAKLEY, BLICKS HP18 9PY, UK.

TITLE
CS 6005-60025
 CIRCUIT DIAGRAM

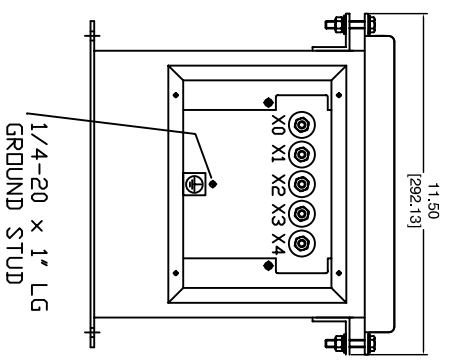
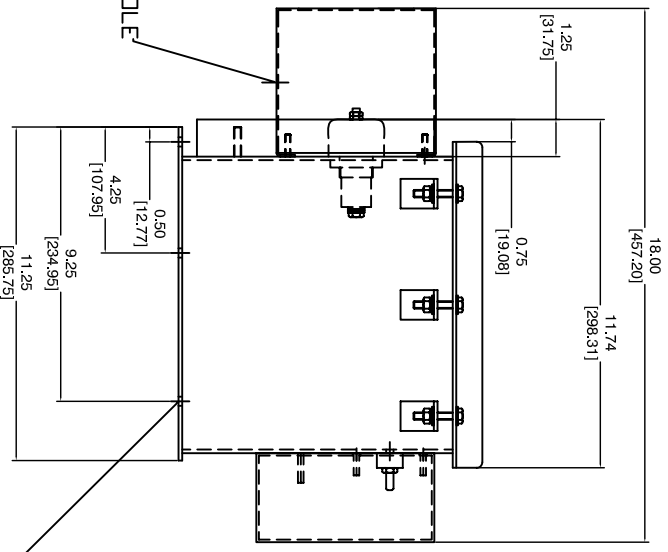
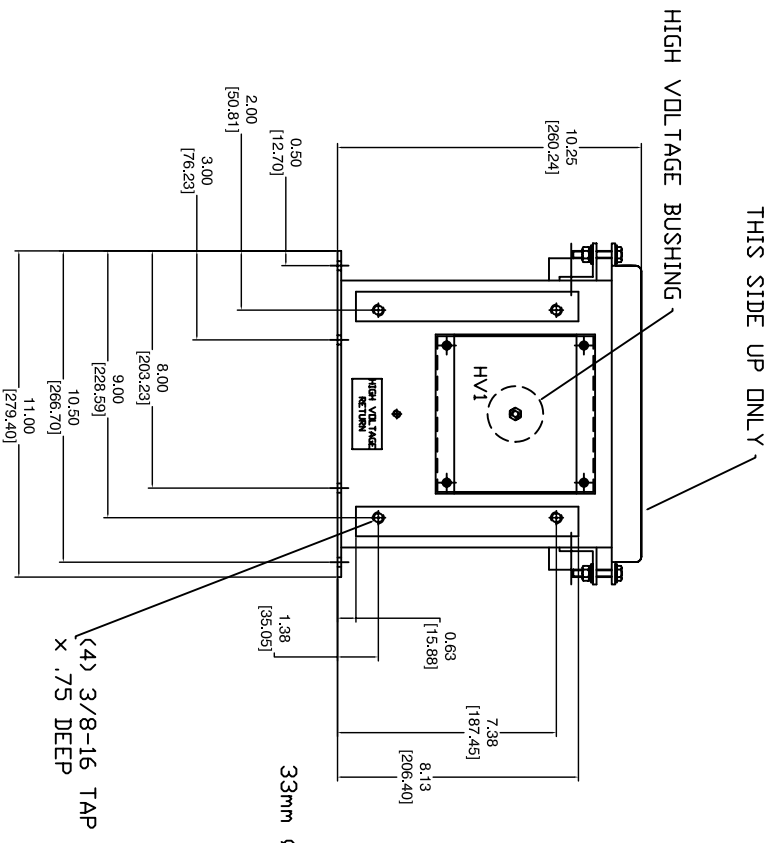
BRAVING NUMBER
 SHIT DF AC

ISS.	DESCRIPTION & DATE	MODIFICATIONS
1	PROD. ISSUE 01/10/08	

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1 2 3 4 5 6 7 8 9 10

THIRD ANGLE PROJECTION
 DO NOT SCALE
 IF IN DOUBT ASK



(6) 5/16Ø MTG HOLES

APPROVED	DRAWN	MATERIAL
DATE	10/09/08	FINISH
TRACED	CHECKED	DATE

B. R. Carter

TOLERANCES UNLESS OTHERWISE STATED DIMENSIONS

UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN MILLIMETRES

Corona Supplies Ltd
 26 FORESTERS, DAKLEY, BUCKS HP18 9PY, UK.



TITLE
 HT TRANSFORMER
 0.5 KW - 3.5KW

DRAWING NUMBER

SHT OF A3

1	PROD. ISSUE
	10/09/08
ISS.	DESCRIPTION & DATE
	MODIFICATIONS

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**FOR FURTHER ASSISTANCE, PARTS OR SERVICE
PLEASE CONTACT US IMMEDIATELY**

THANK YOU