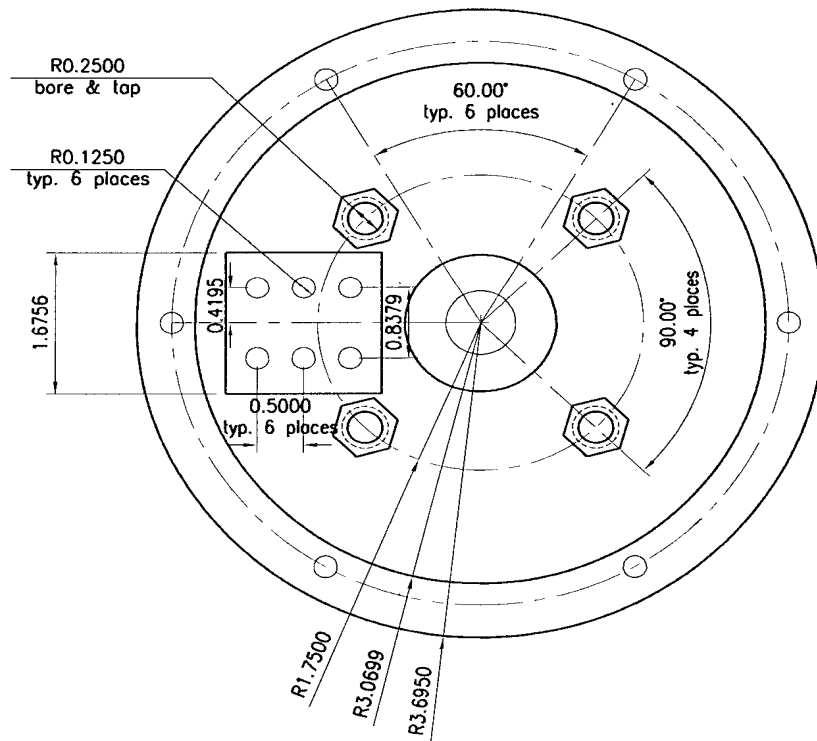
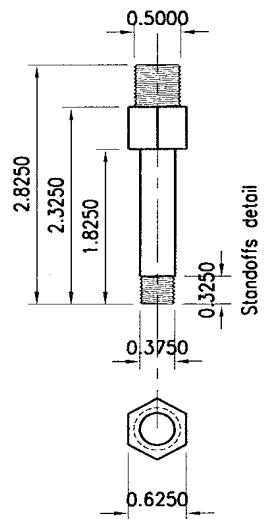
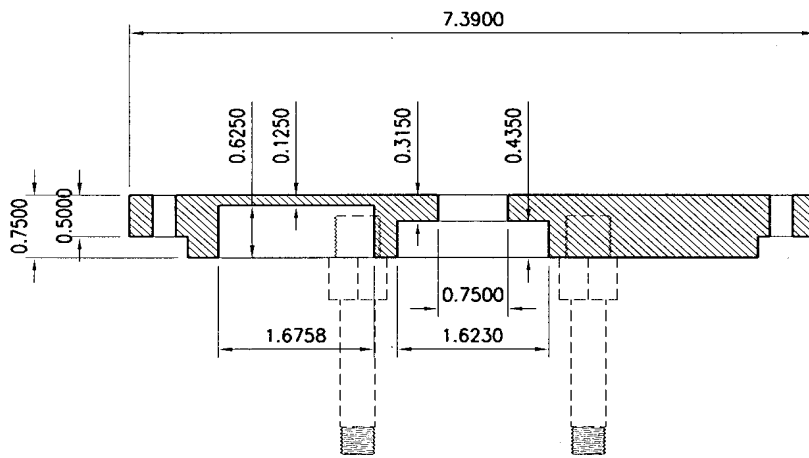
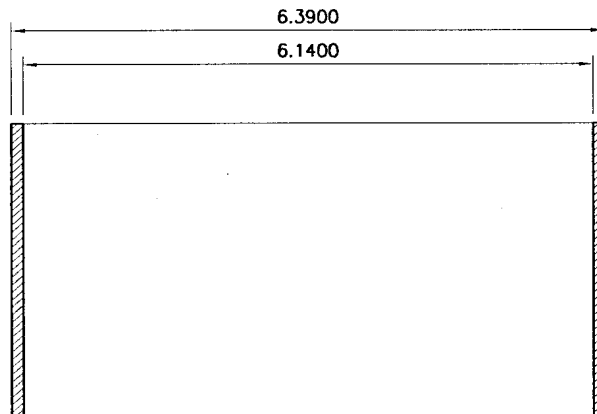


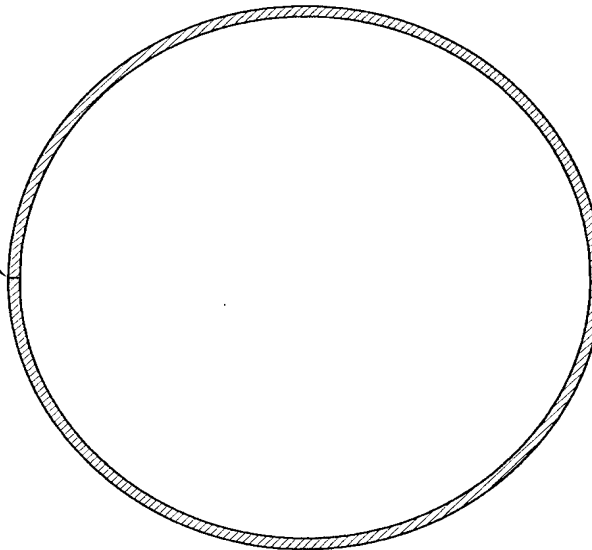
Permag 7" Motor Front Plate



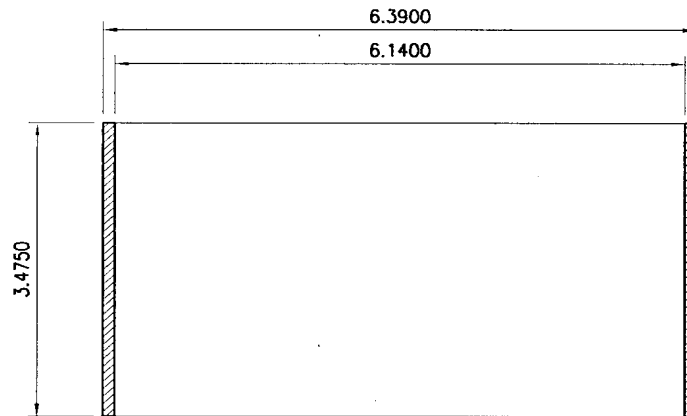
Permog 7" Motor Front Plate



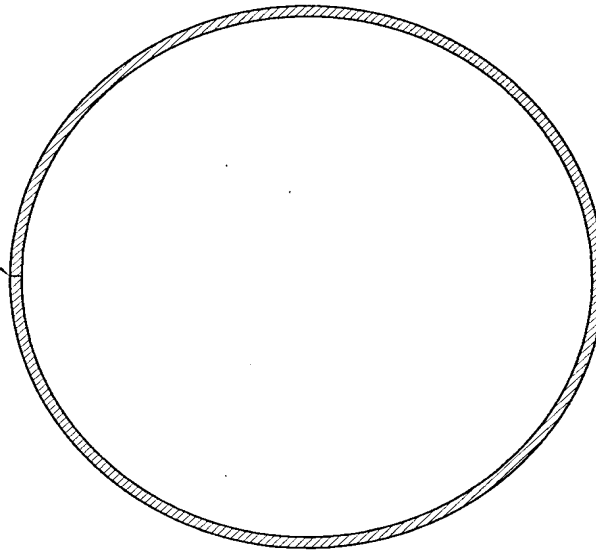
Fuse Weld Band
& Polish



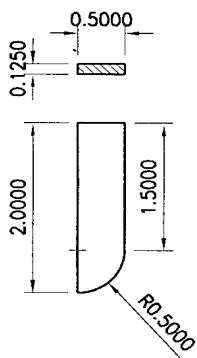
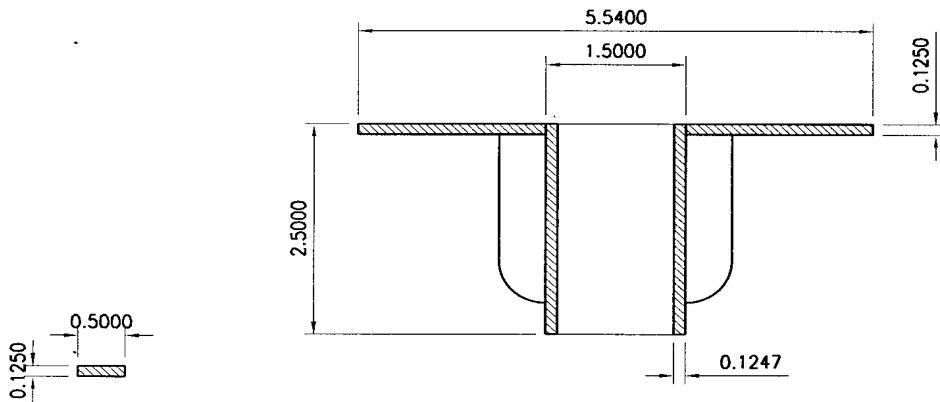
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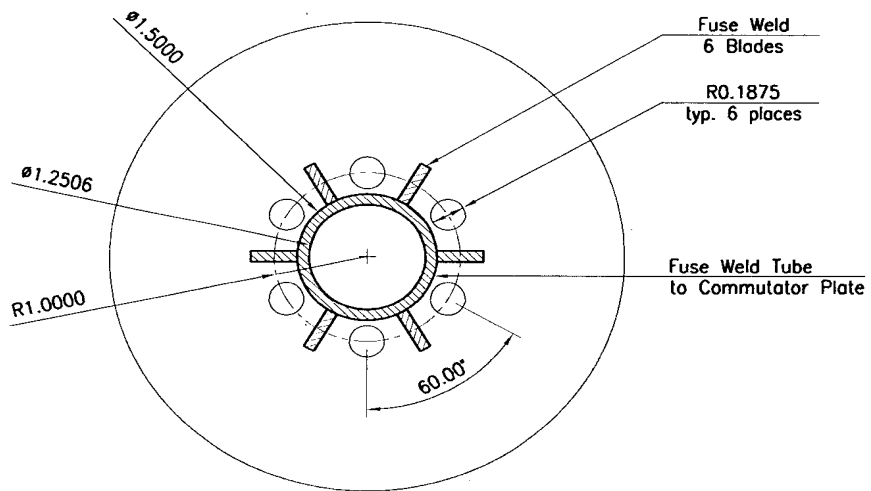
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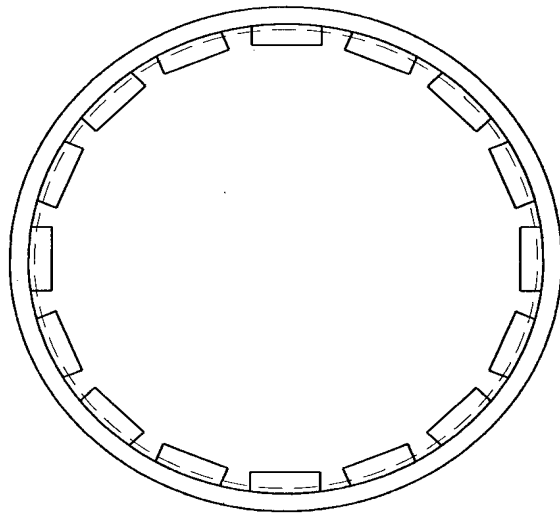
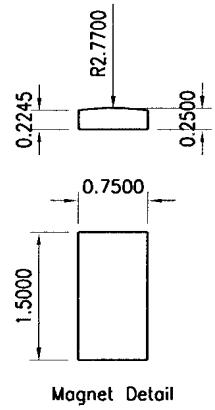
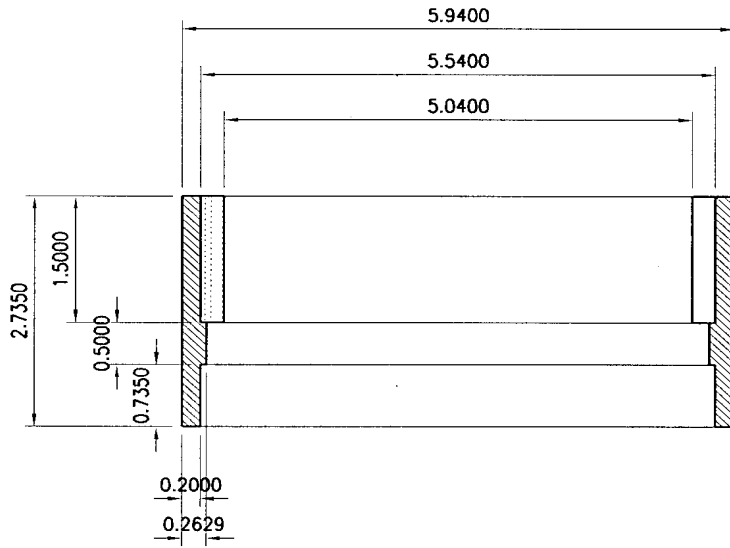
Permag 7" Motor Front Plate



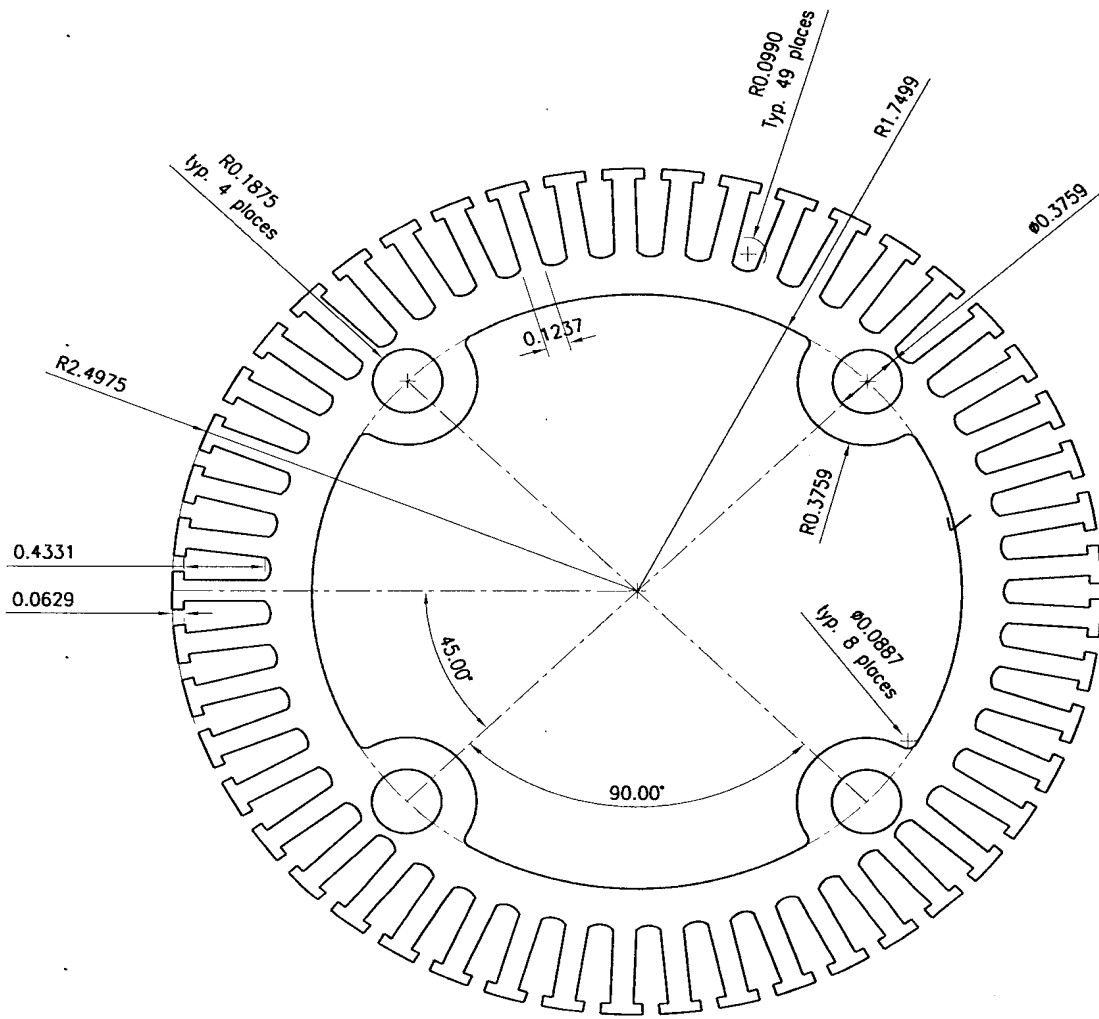
Fan Blade Detail

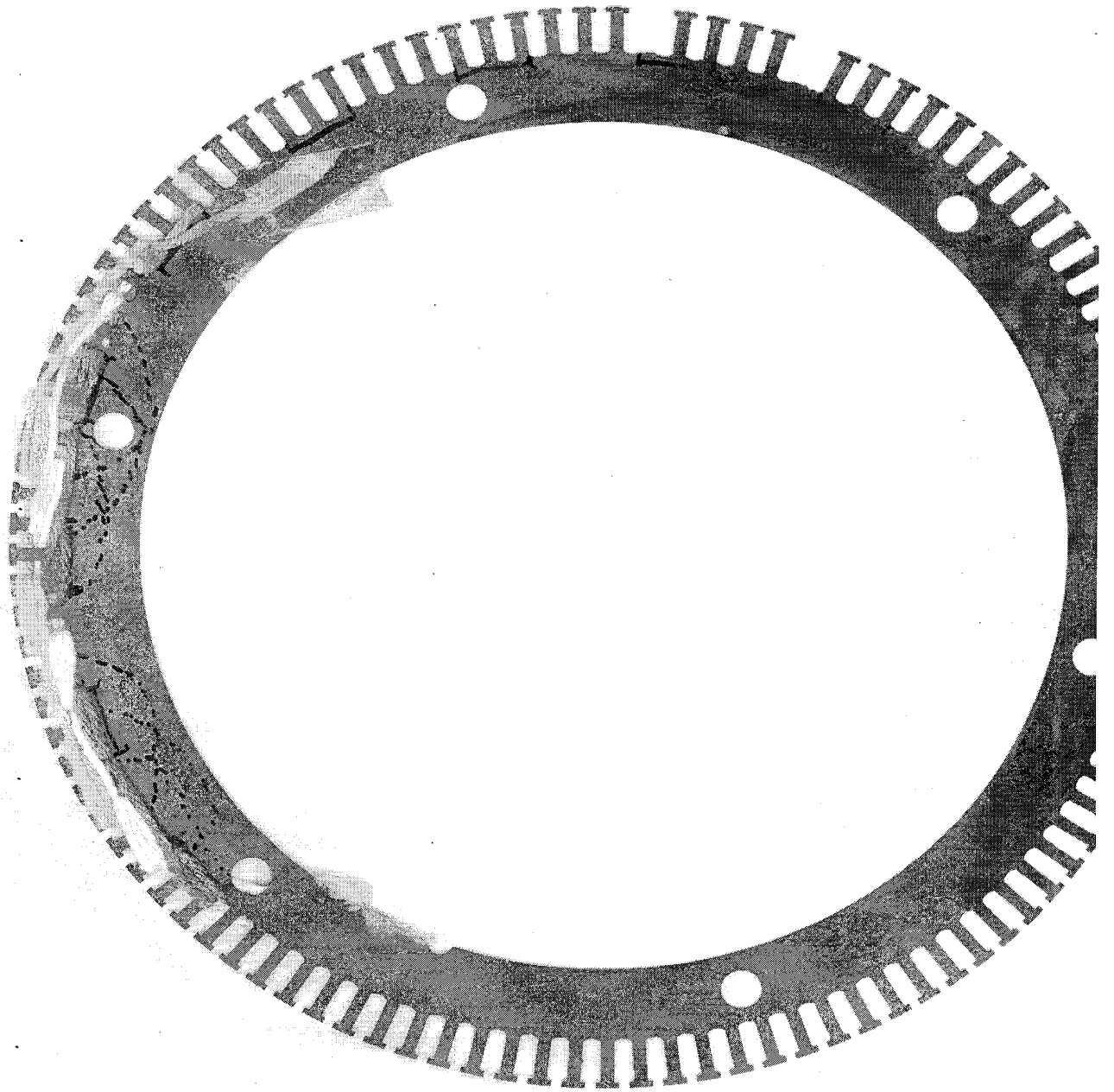


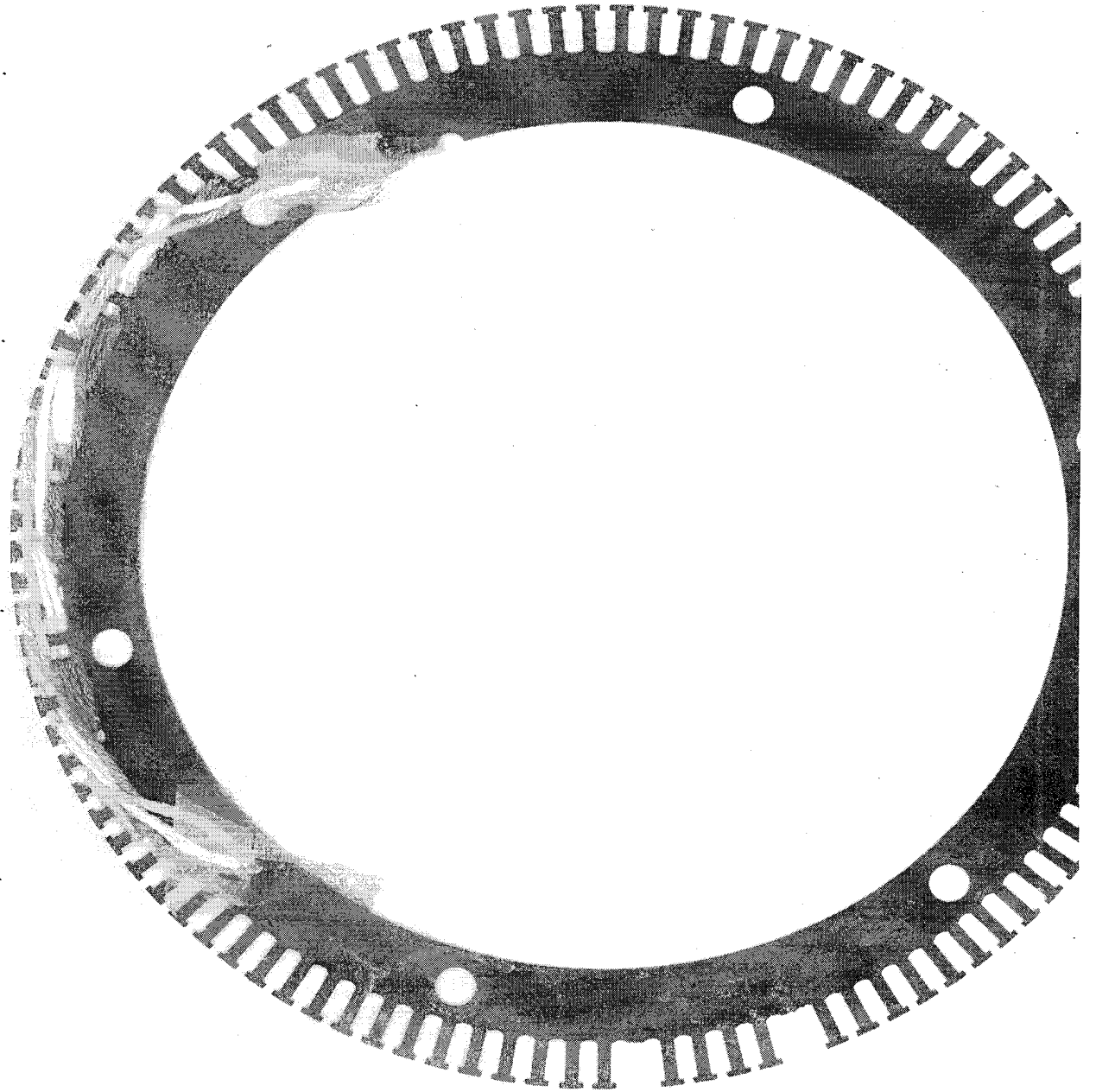
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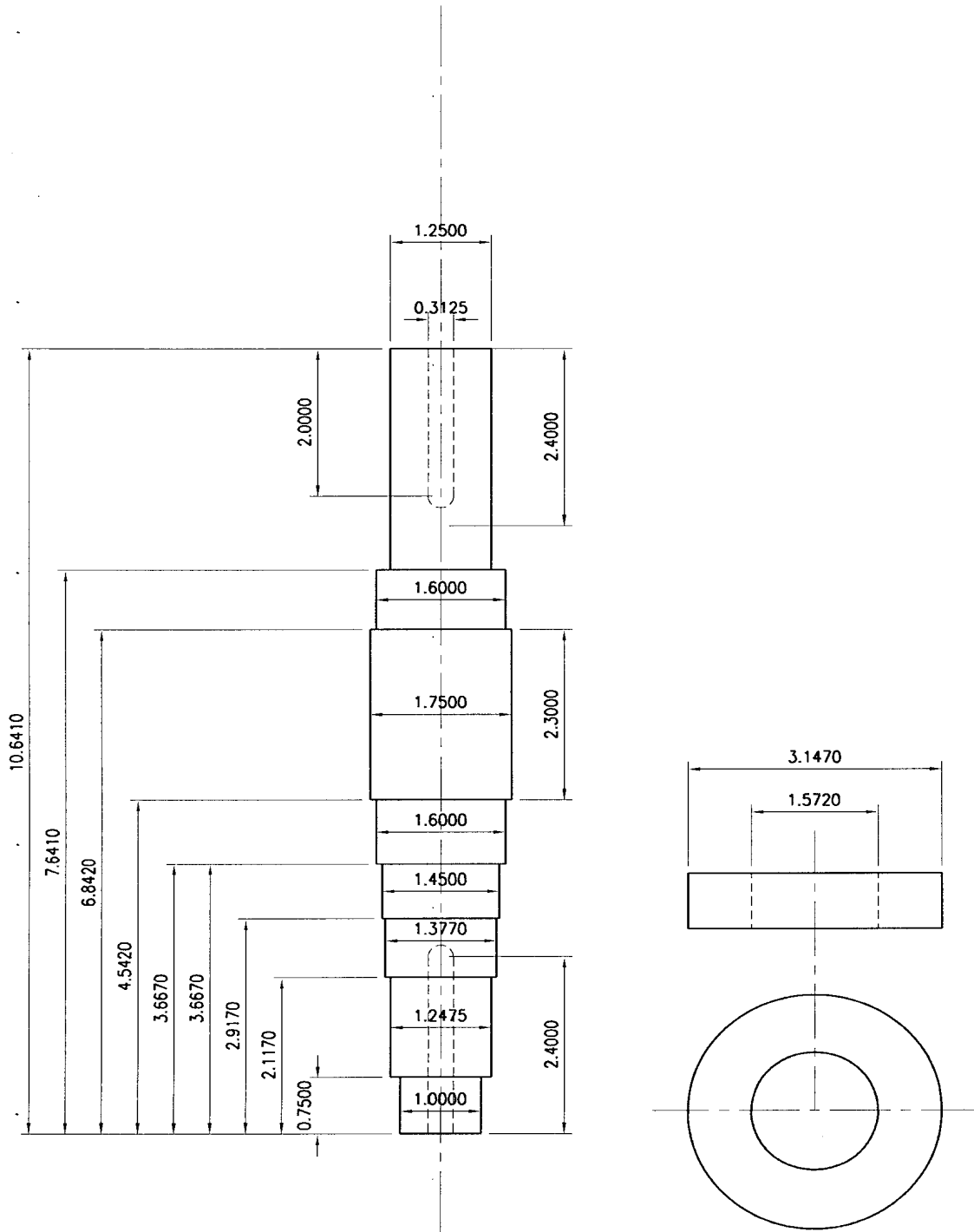
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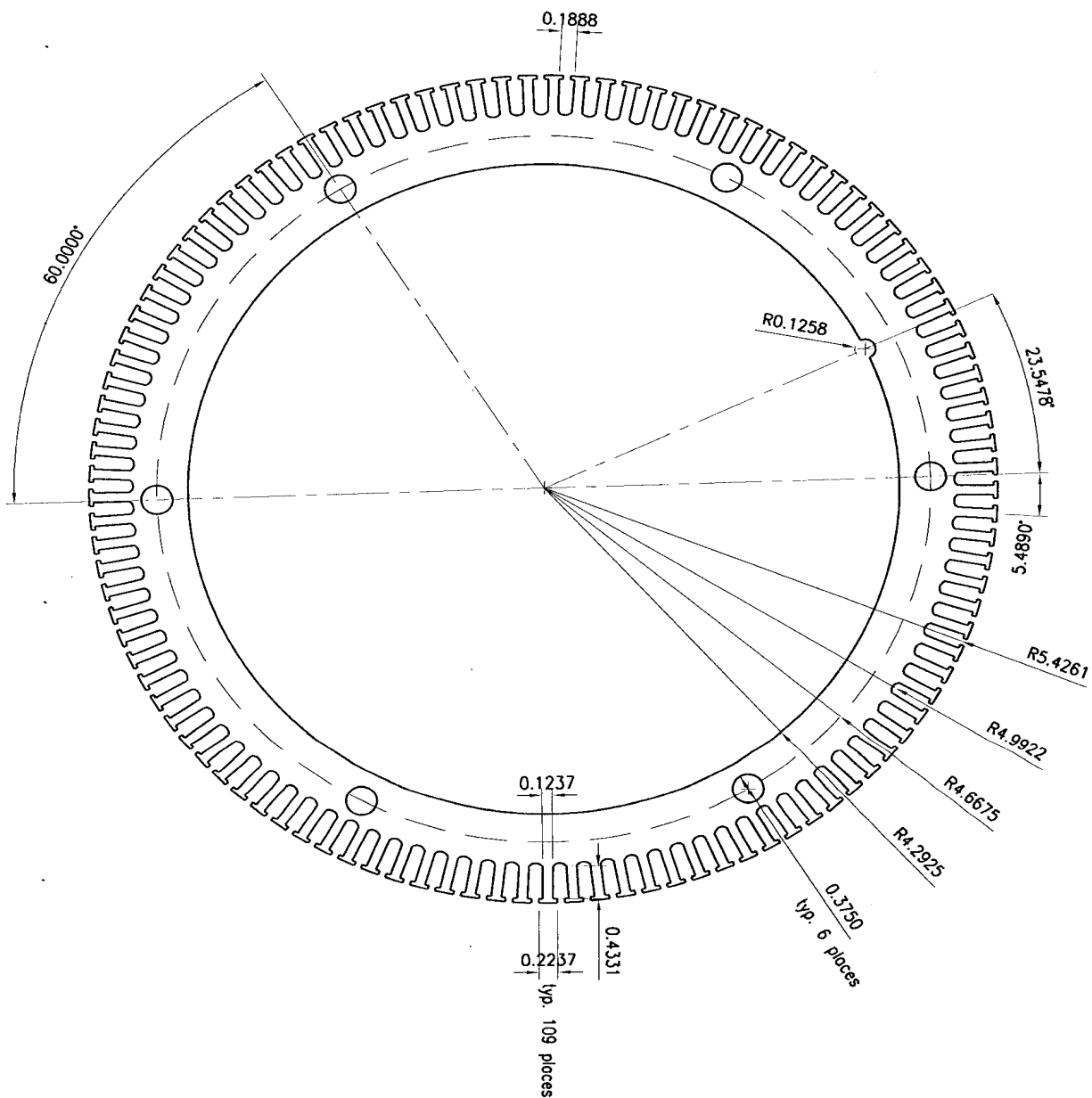




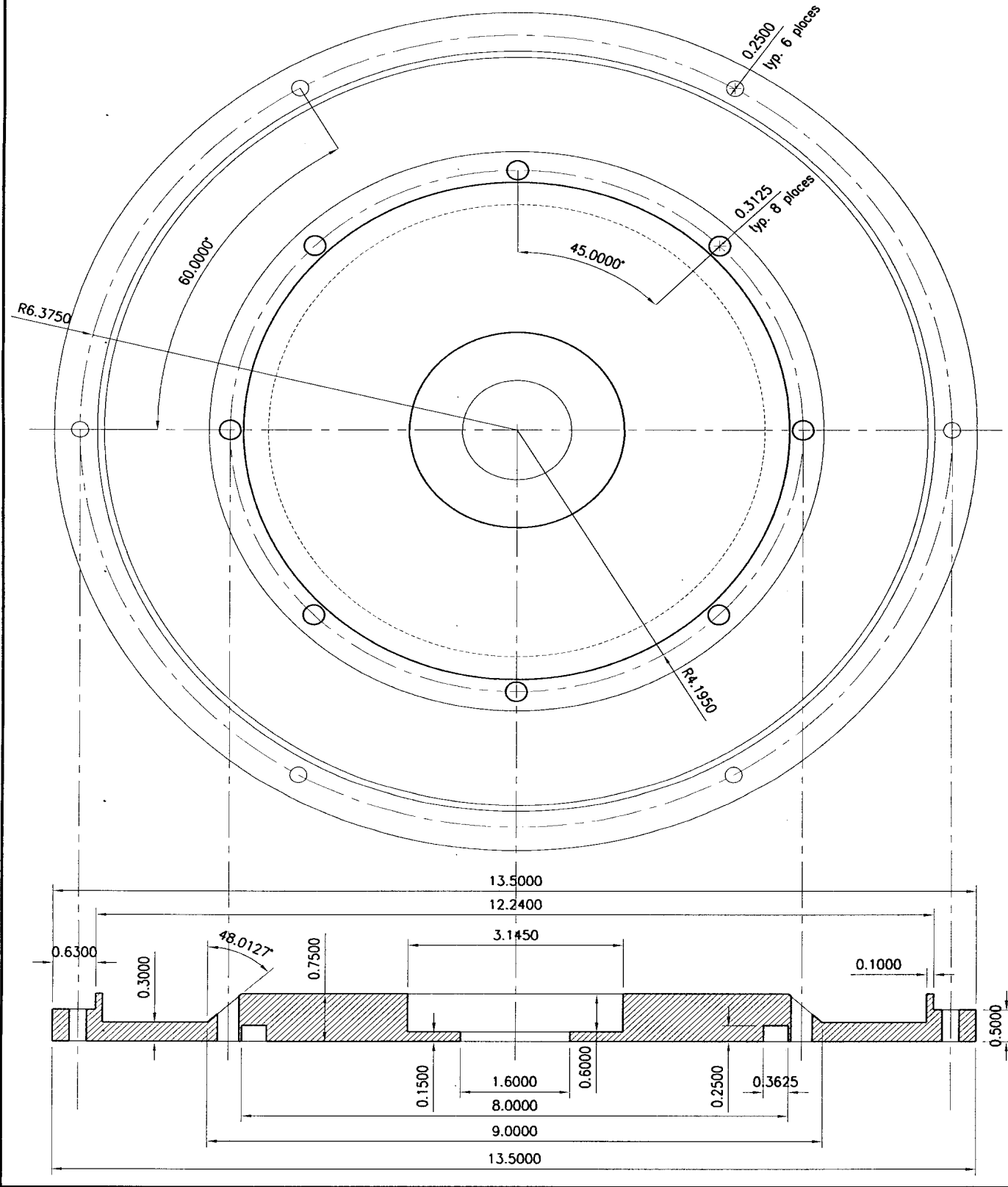


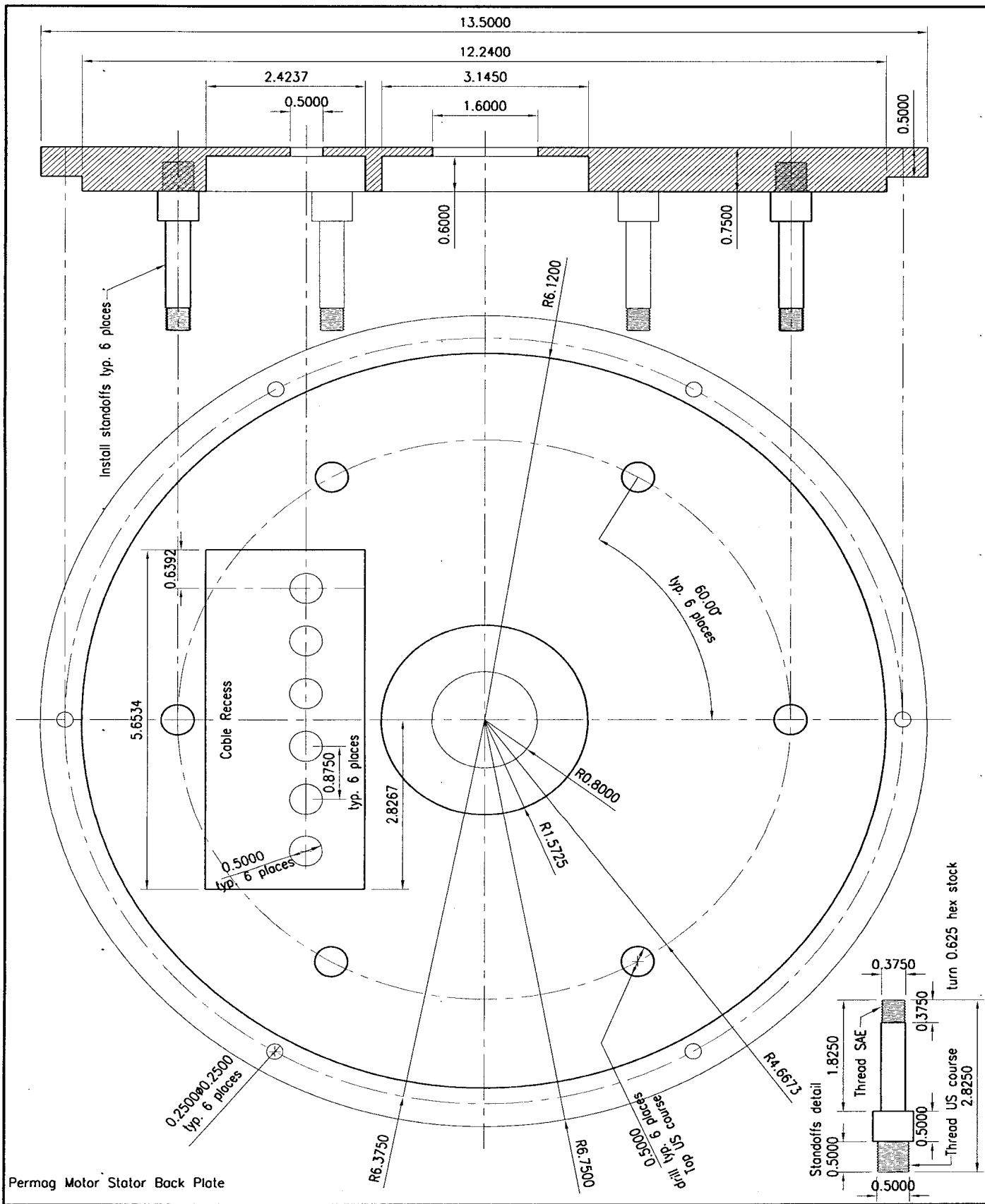
Brandt 40 hourse Roter Shaft





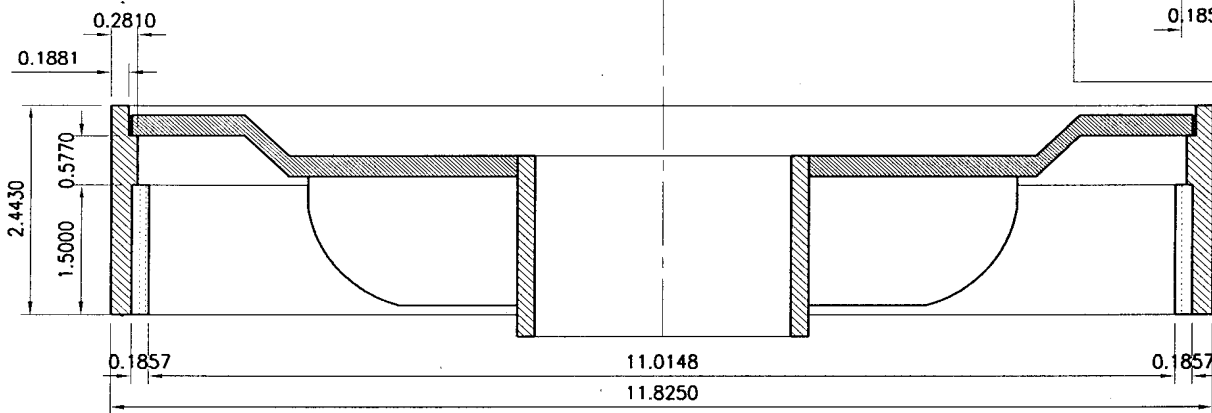
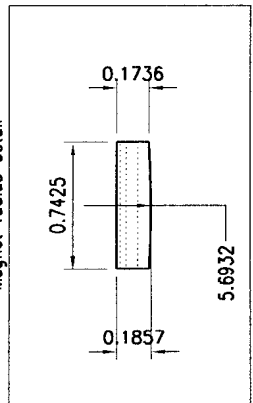
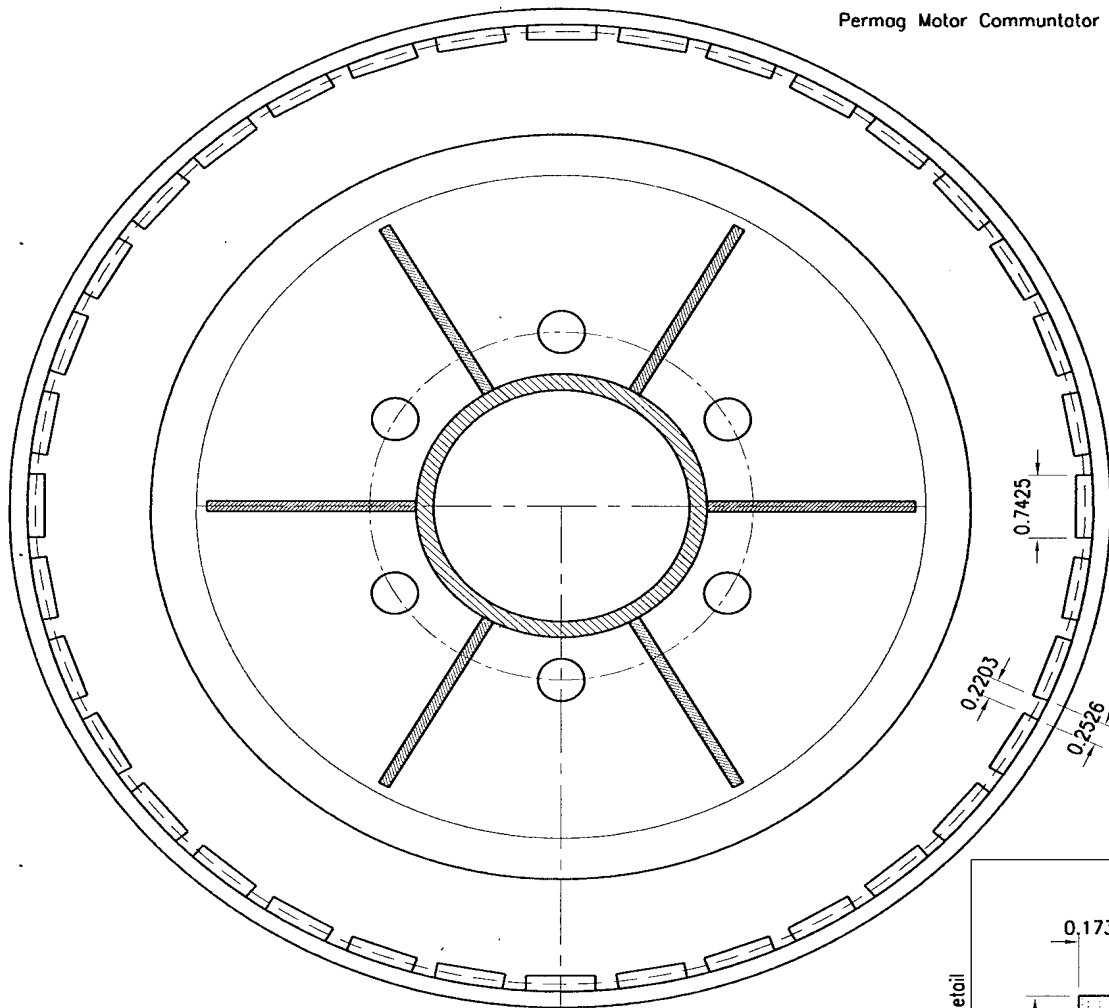
Brandt Stater Front Plate

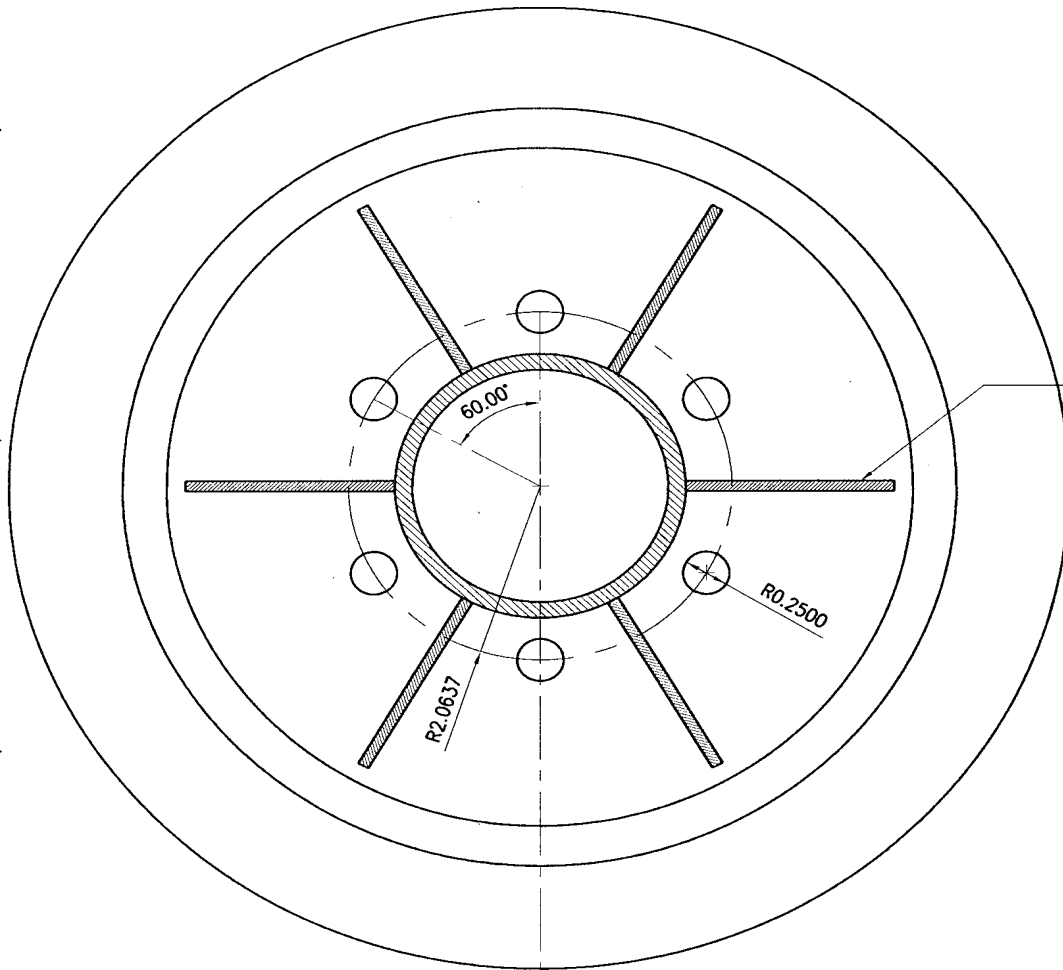




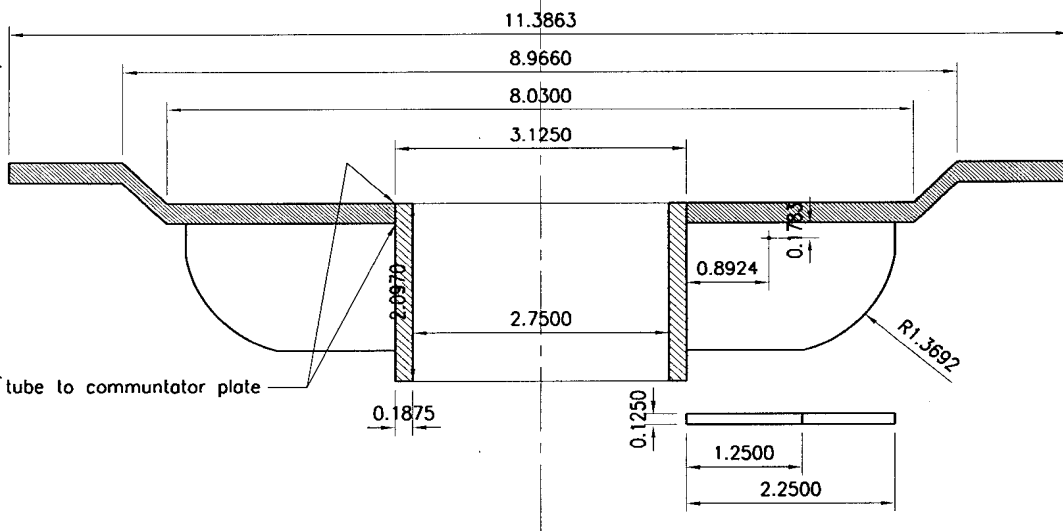
Permago Motor Stator Back Plate

Permag Motor Communtator Plate Assembly

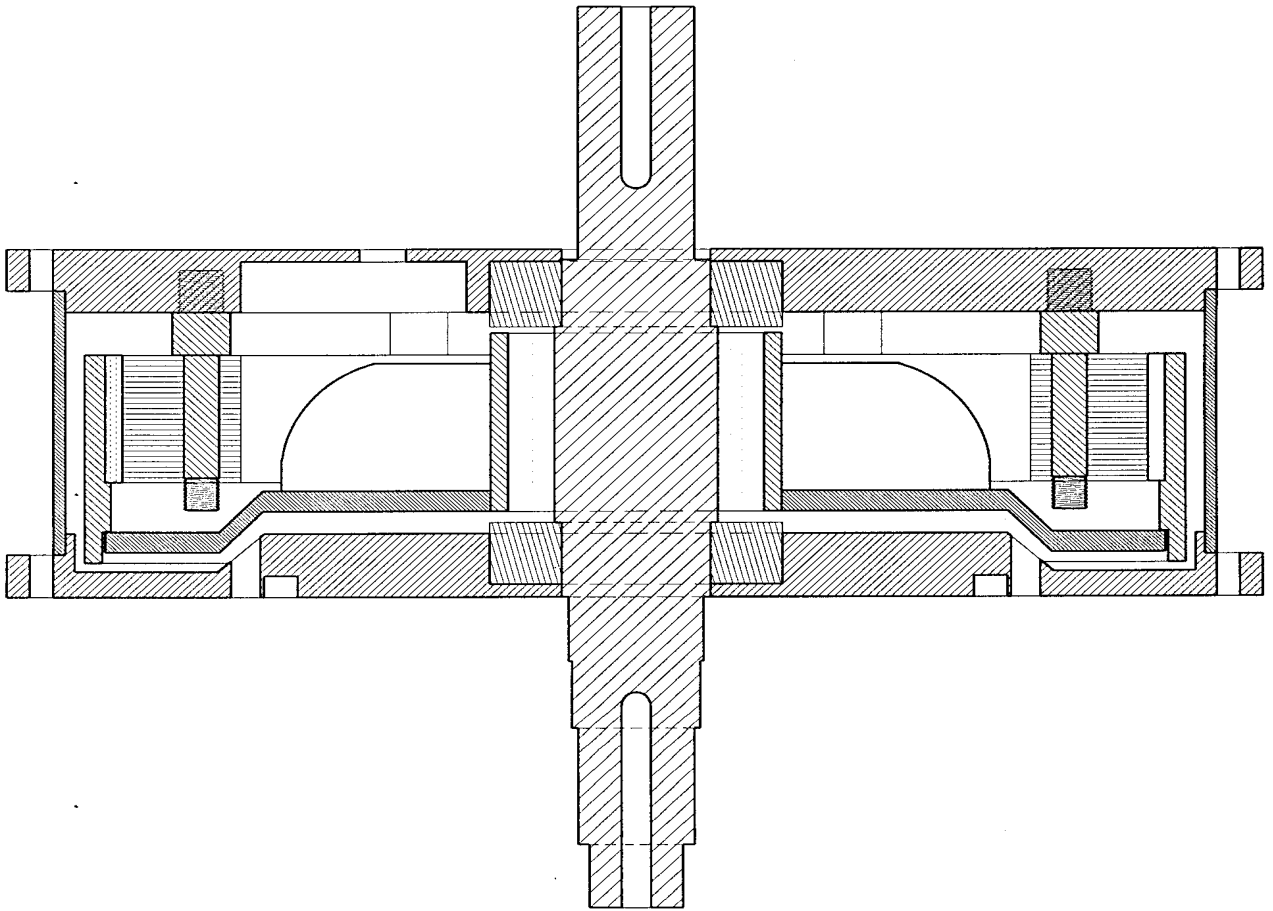




Fuse weld fan blades typ. 6



Fuse weld tube to commutator plate



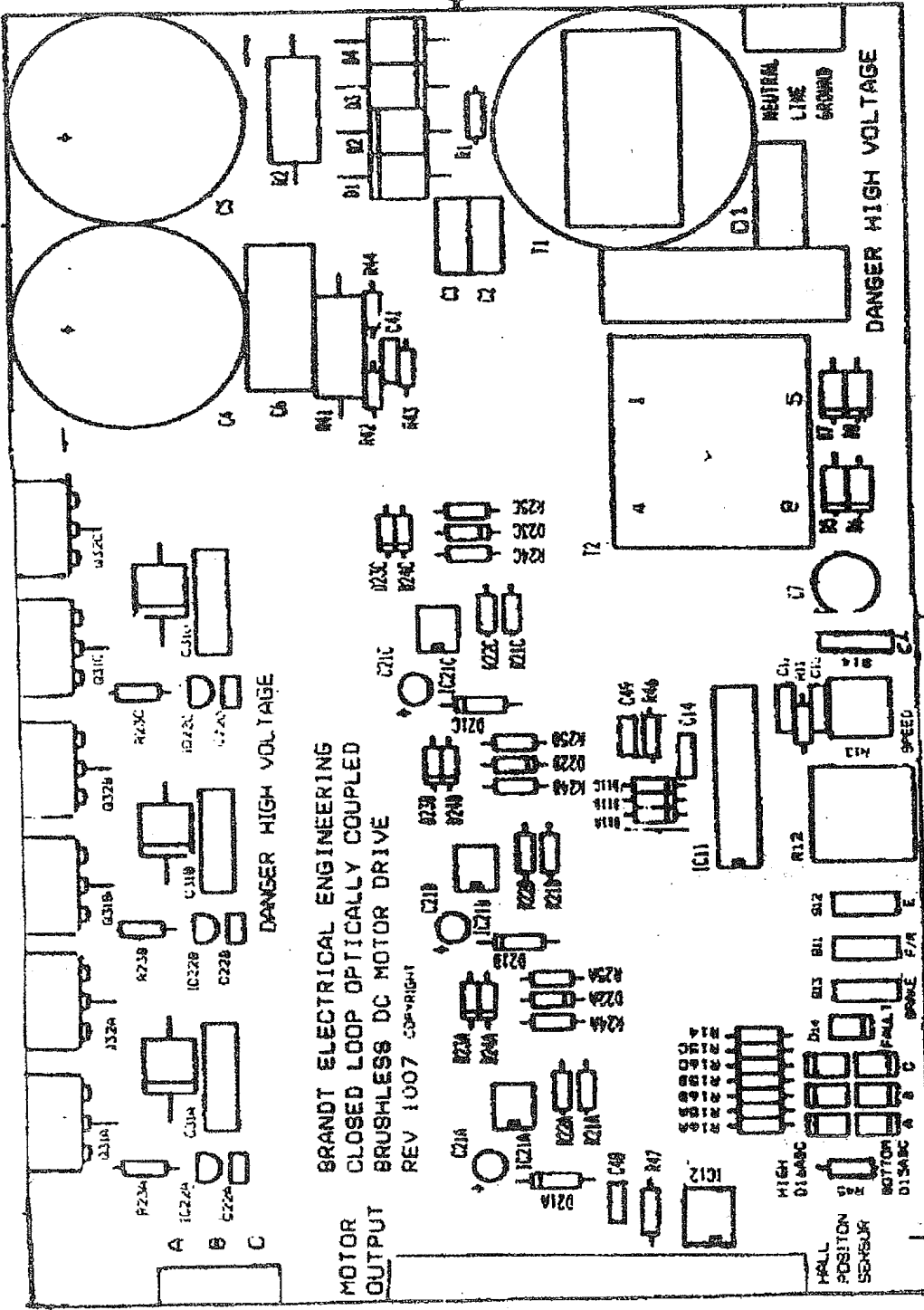
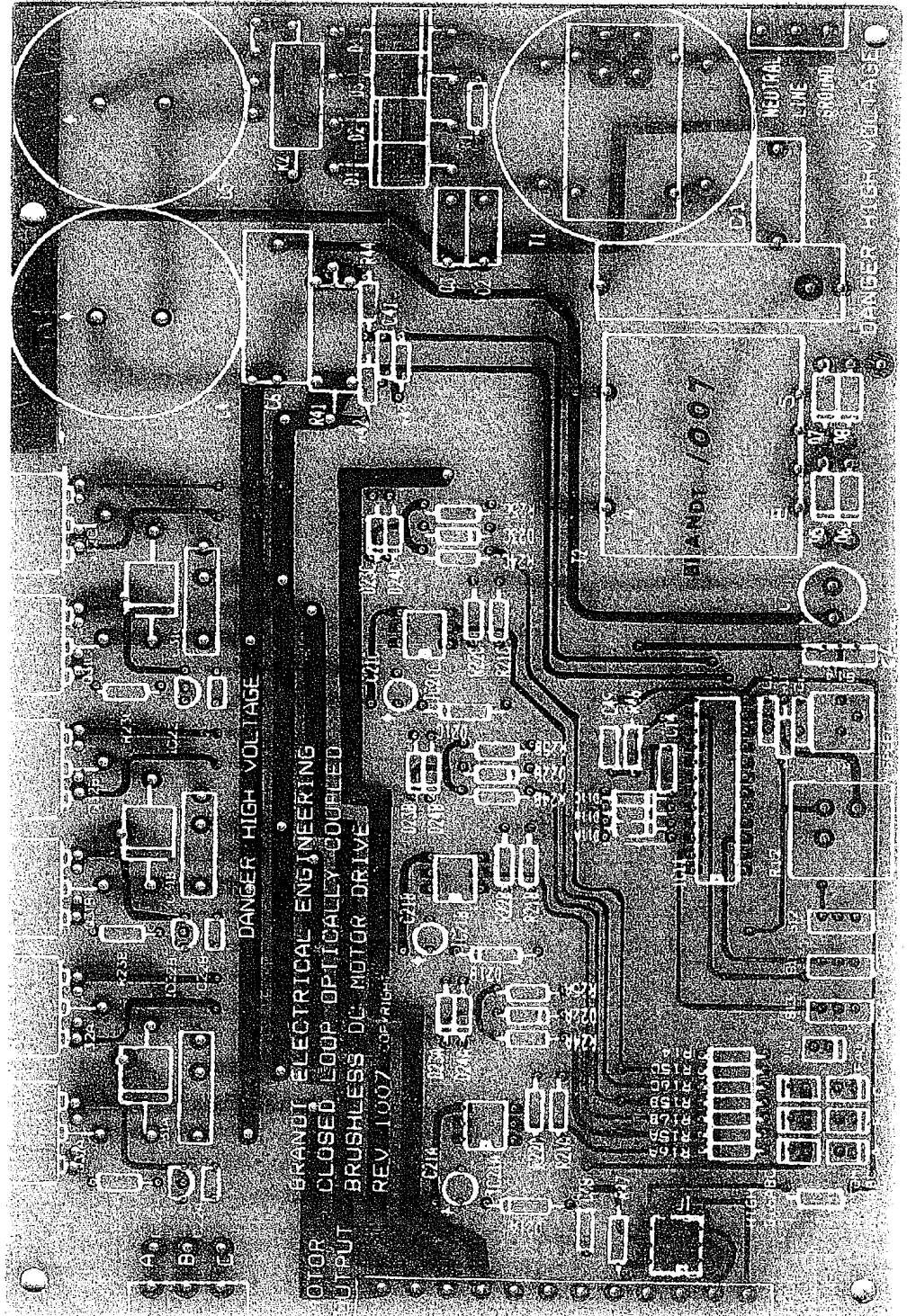
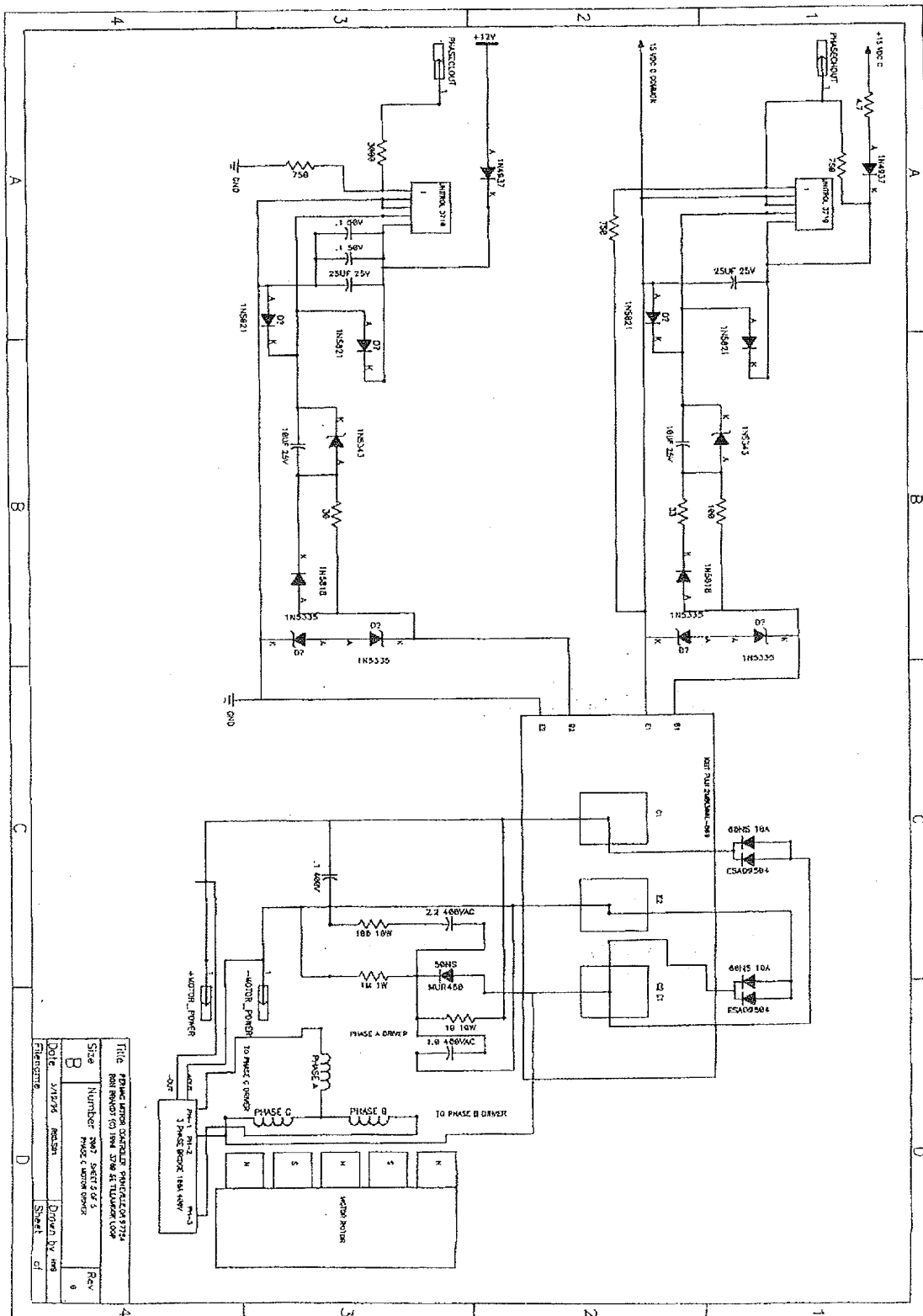
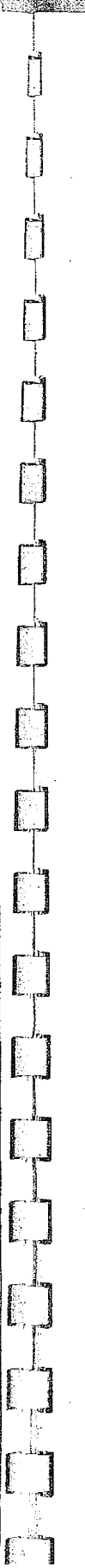
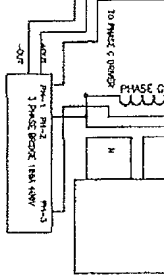


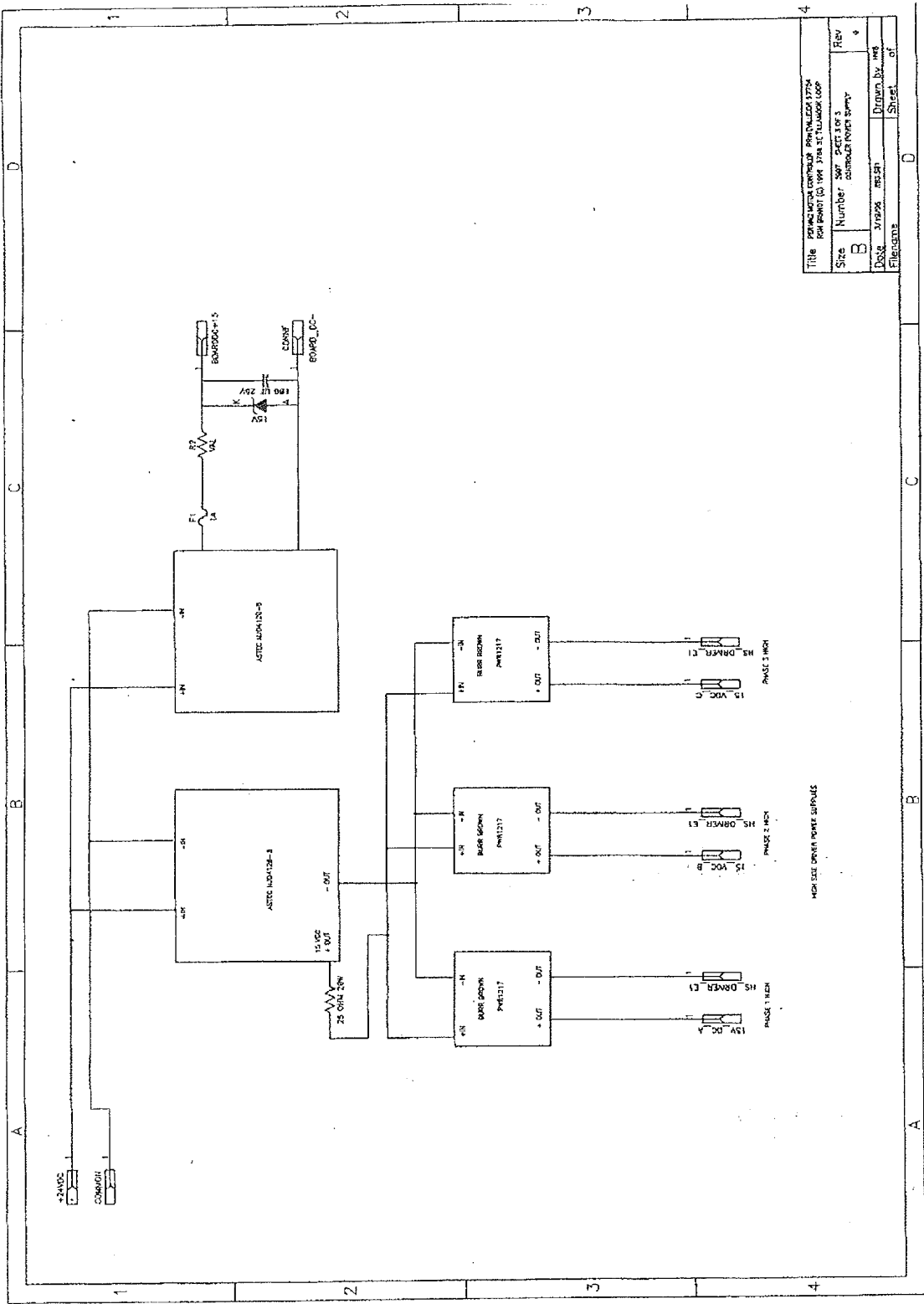
Figure 7. SII ksc room Layer





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CHECKED BY					
APPROVED BY					
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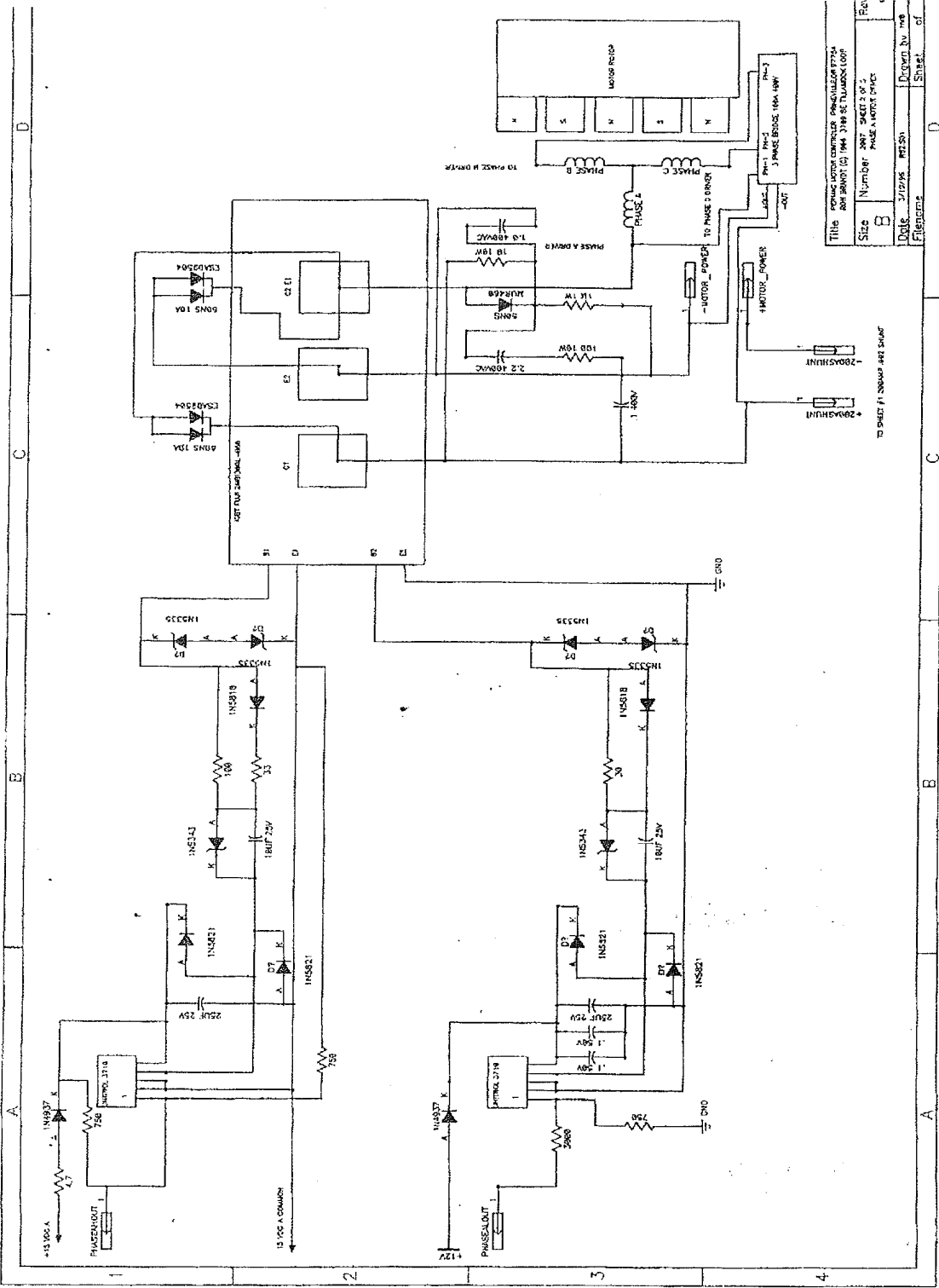
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PHASE 2 INCH

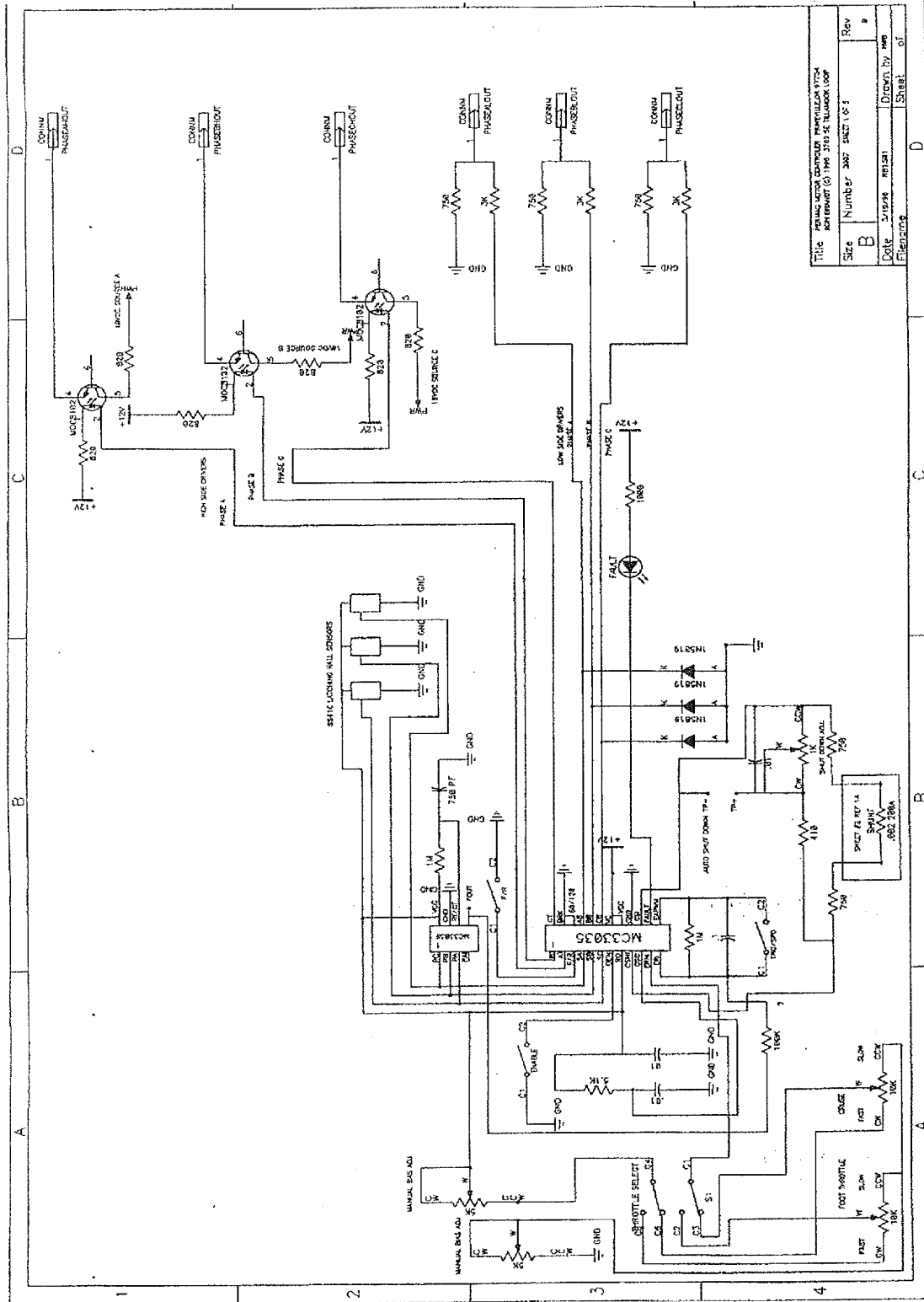
PHASE 3 INCH

SEE DRIVEN POWER SUPPLIES



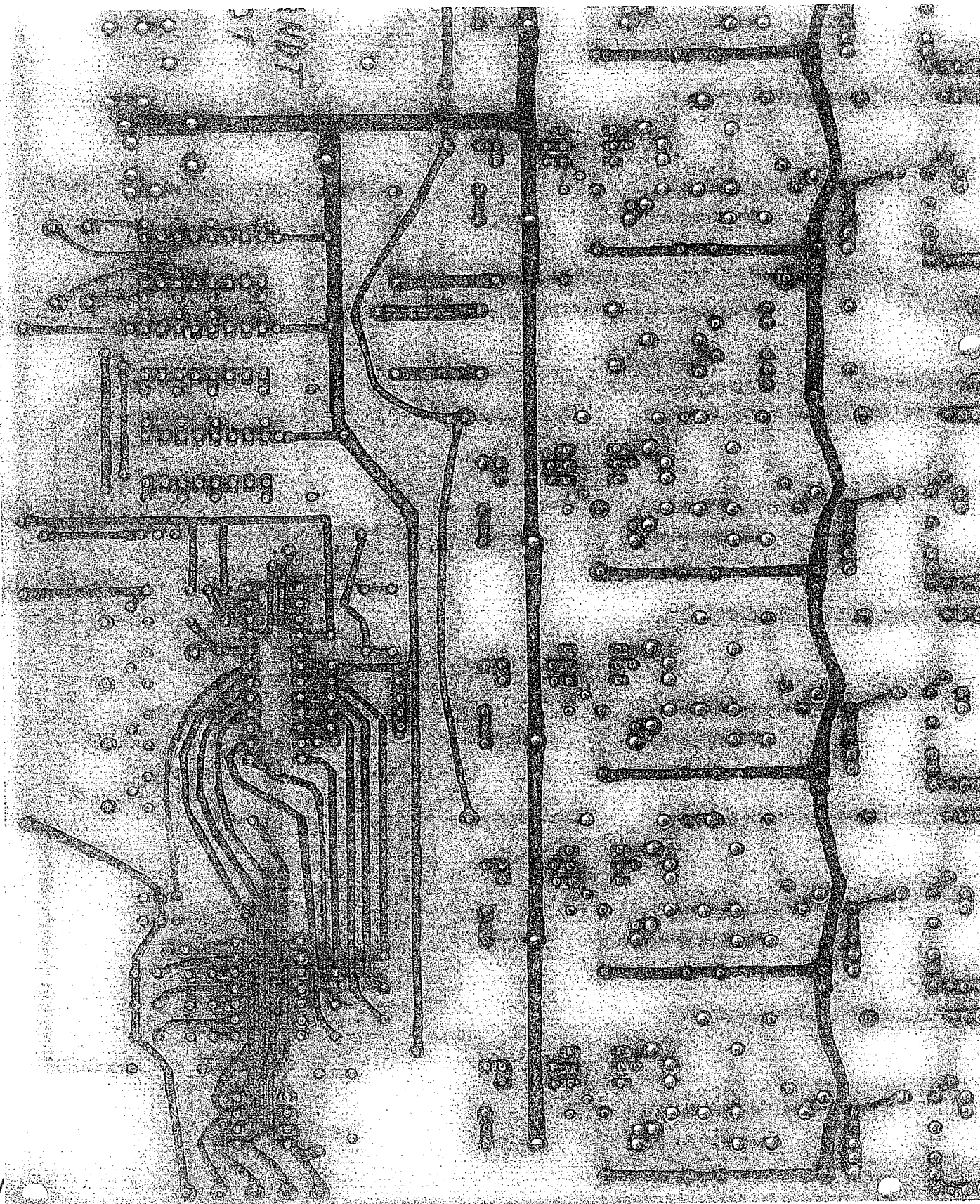
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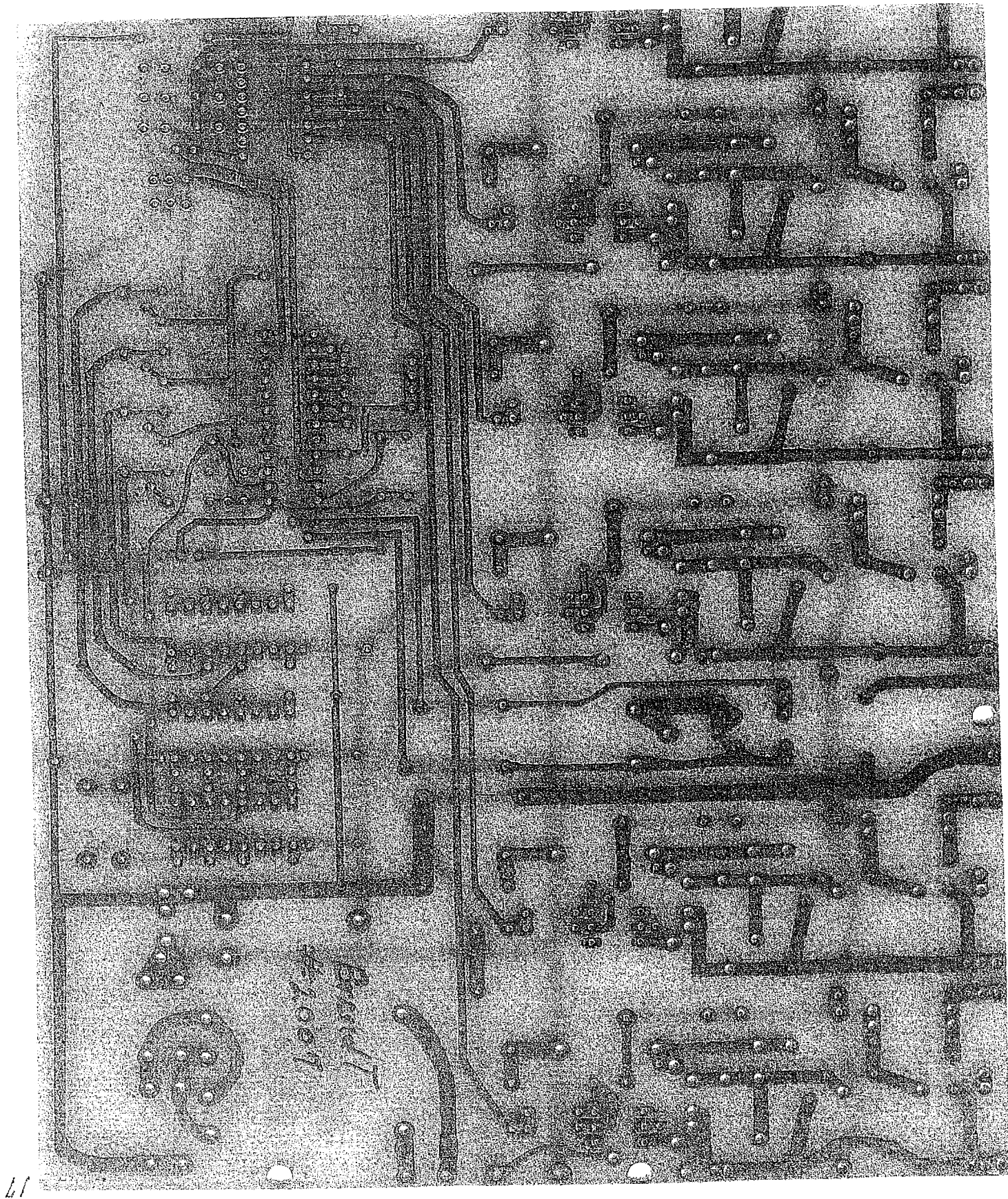
TO SHEET #1 SHOWS AND SINGS



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Sheet	1 of 1

15

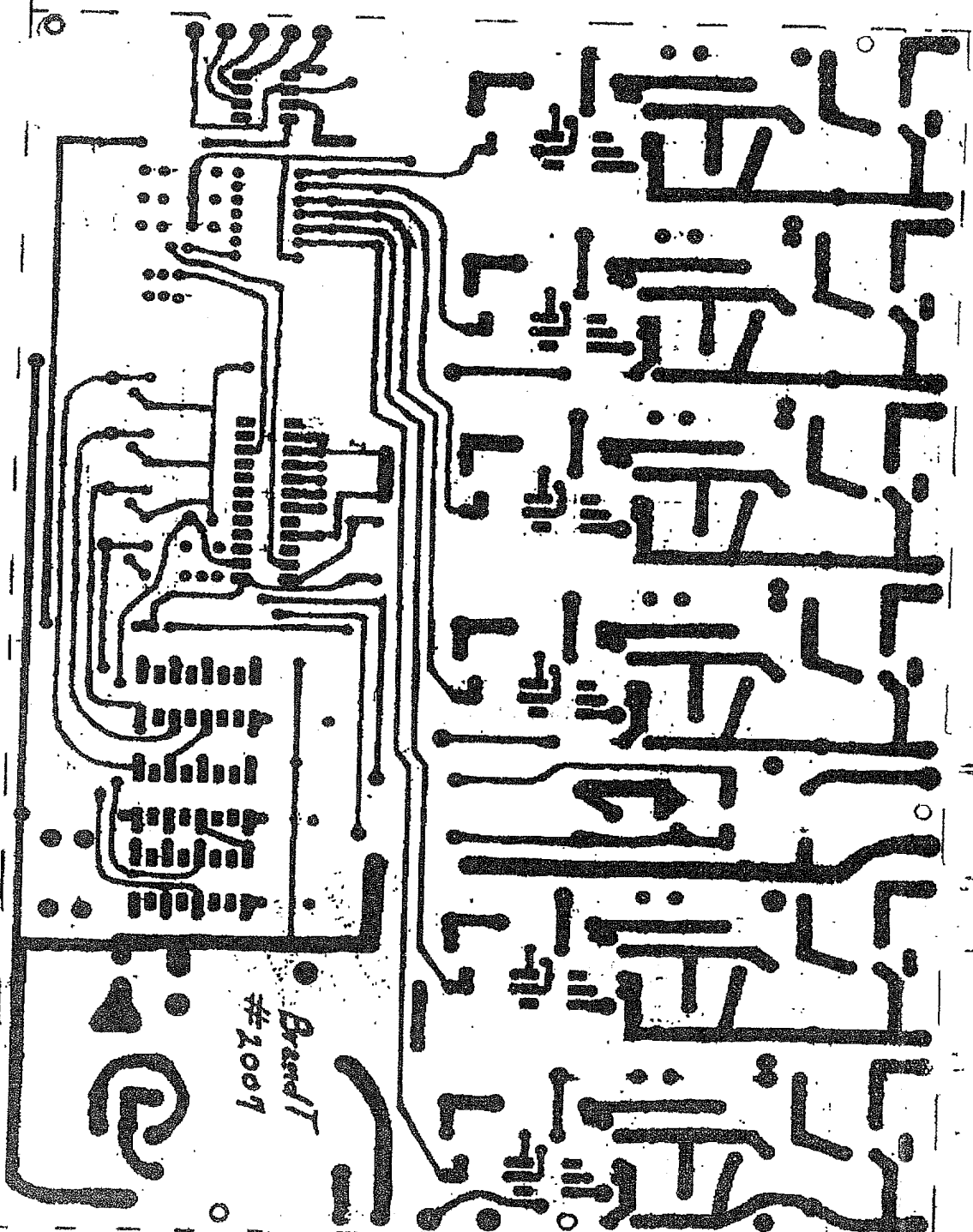




BRANDT ELECTRONIC ENGINEERING
112 WAATILIA
PRINCETON, OREGON 97134
503-438-1100

Component Side

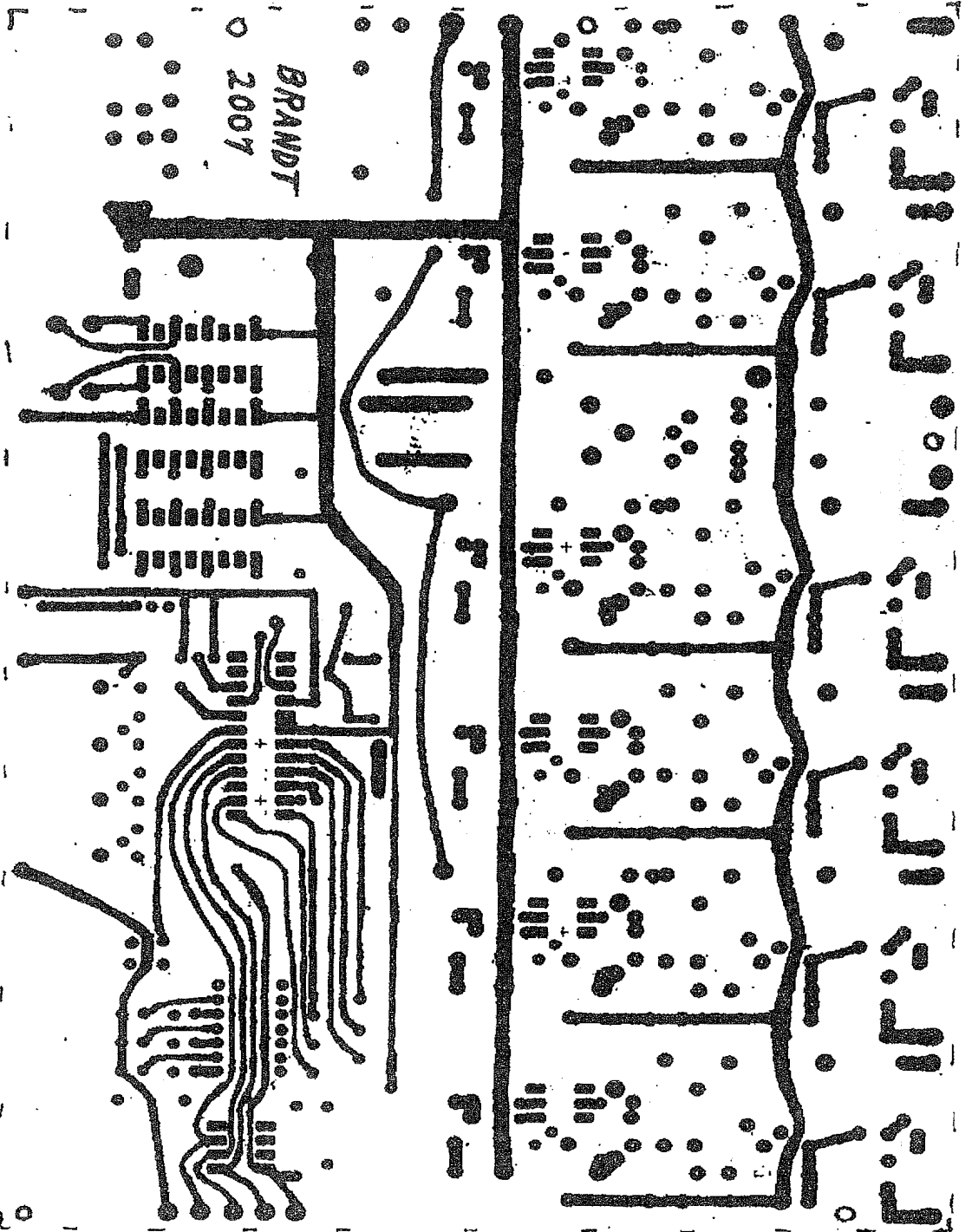
BRANDT ELECTRONIC ENGINEERING
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PRINCETON, OREGON 97134
503-438-1100



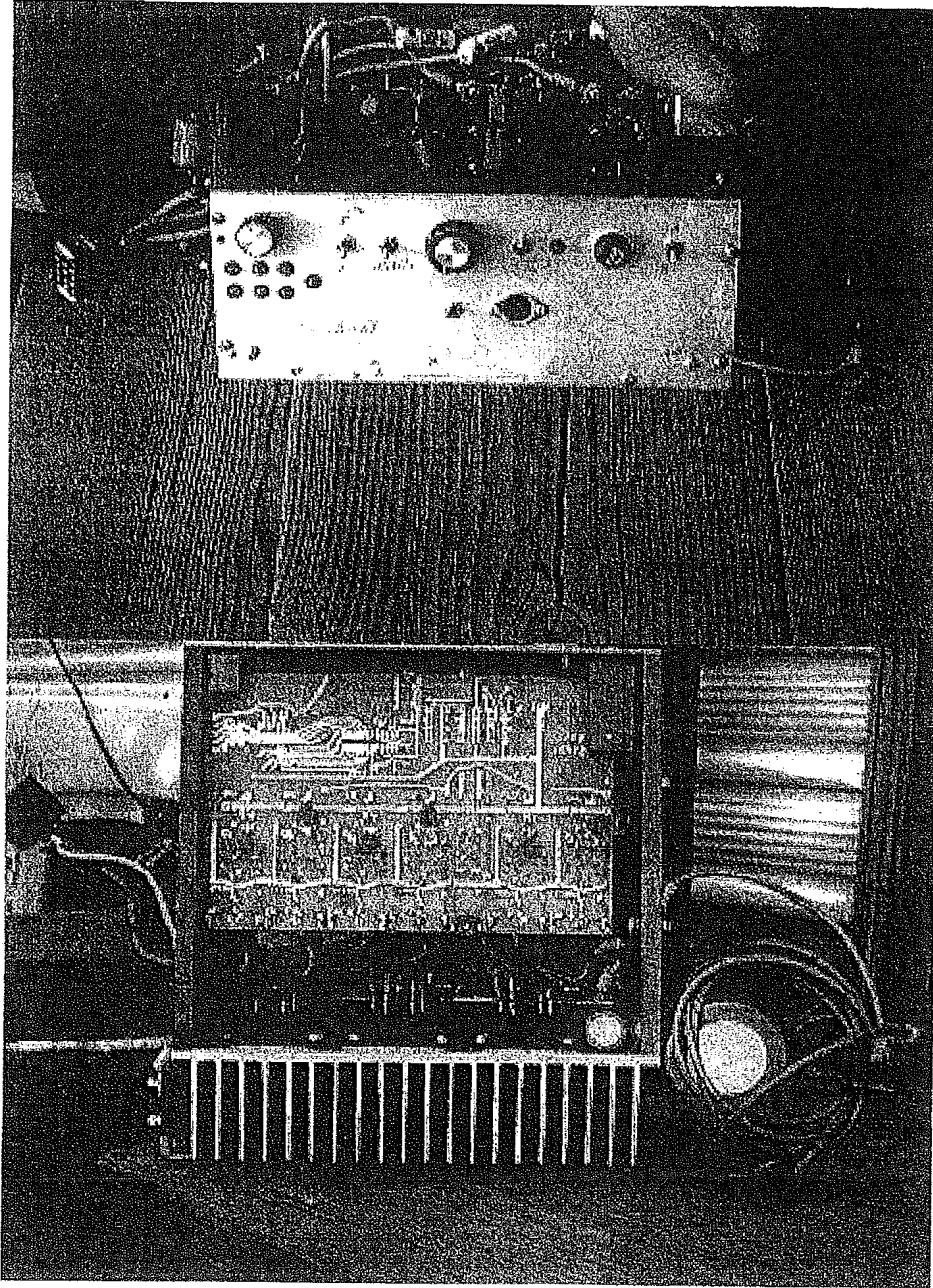
Brandt
#2007

BRANDT ELECTRICAL ENGINEERING
ALHAMBRA ST
MOUNTAIN VIEW
CITY, CA 91761

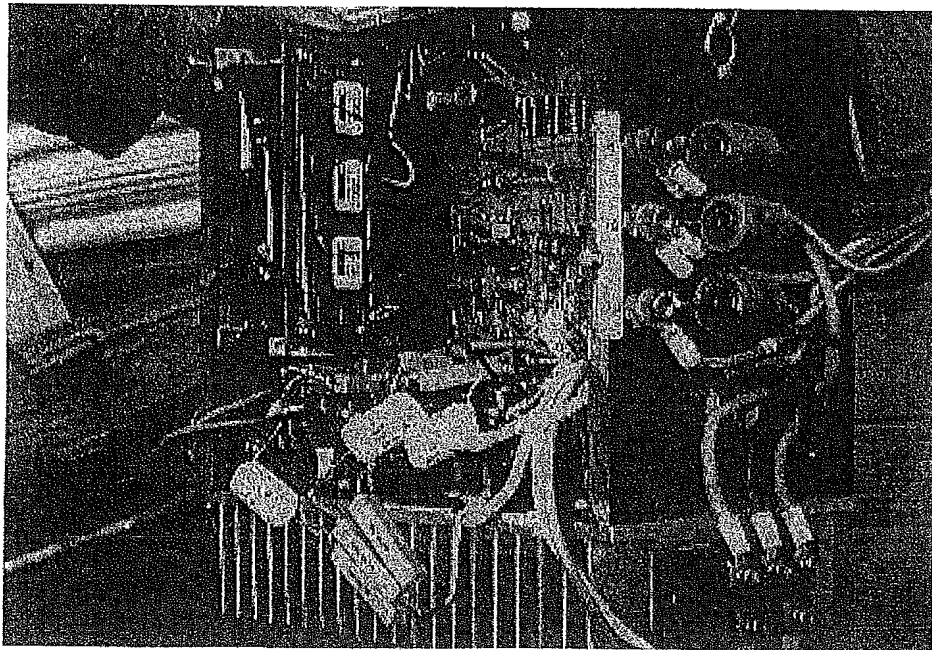
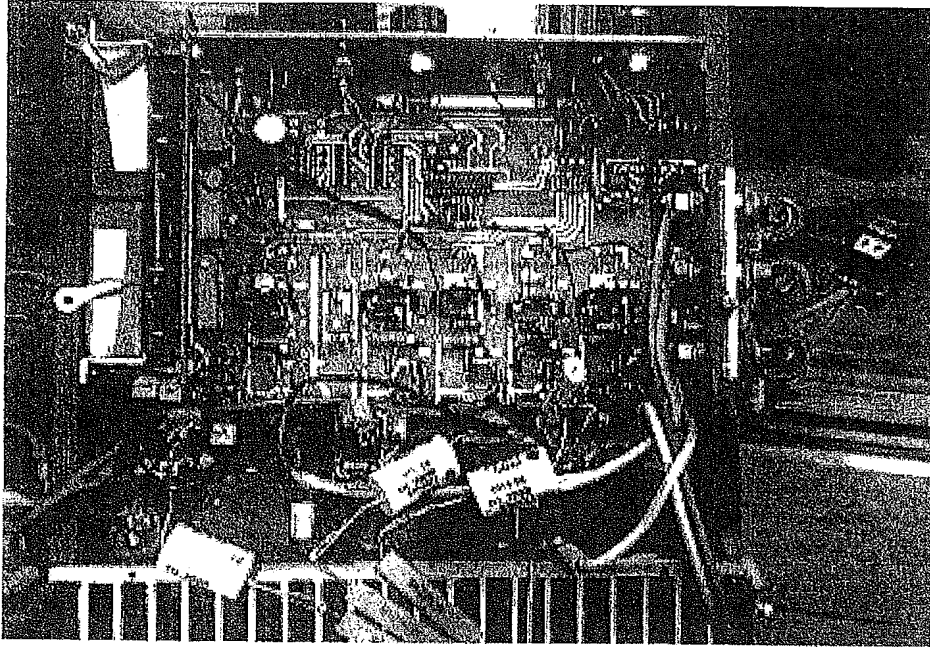
Solder Side



BRANDT ELECTRICAL ENGINEERING
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PRINCETON, OREGON 97134
503 477-7770



21



Brandt Closed Loop Optically Coupled BLDC Motor Drive System Operational Summary

Brushless DC (BLDC) Motors are used in a number of applications where low noise, highly efficient operation is desired. These motors compare favorably to other DC and AC motors. These motors are controlled by adjusting the field winding voltage/current typically in conjunction with monitoring the rotor position by means of position sensors and tachometers. Although, these motors are very efficient (> 90% in some cases) they do require external power sources to drive the control circuitry and have losses. The losses are mechanical, primarily frictional, and electromagnetic. Frictional losses may be harnessed to aid in cooling the motor; however, electromagnetic losses are typically unaddressed.

The Brandt Closed Loop Optically Coupled BLDC Motor Drive System is designed to harvest the unused electromagnetic energy. The system employs Hall sensors for position sensing, optical switches for phase excitation and a high performance controller IC equipped with top and bottom driver outputs, programmable oscillator, position sensor decoder. The system separates itself from other drivers by the use of a feedback circuit that captures electromagnetic energy from the field windings. The captured energy is converted to DC and added to the motor power improving the motor's output and increasing its efficiency.

NOTE: Driver system operation is currently being analyzed via simulation and the expected results have yet to be verified.

ABSTRACT

The Brandt Closed Loop Optically Coupled BLDC Motor Drive System is designed to maximize the performance of the motor by harvesting the energy losses associated with the unused back EMF. The system employs two distinct feedback loops. One loop continually gathers rotor position information to determine the current speed and adjusts the width of PWM signal via optical coupling that controls the switching of the field windings. This in turn increases or decreases the motor speed. A second feedback loop gathers the back EMF from the field, rectifies it and adds it to the DC source that sets the signal magnitude of the PWM signal applied to the field or is applied directly to motor output. This adjusts the motor speed, output and thus efficiency. Therefore, system performance is optimized for each state of operation. In addition to these automatic control loops, the system also includes three manual adjustments that provide additional flexibility and control over motor operation.

CLAIMS

"The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:"

1. The present invention is a BLDC motor controller comprising;
five integrated modules;
two electrical feedback loops;
at least one BLDC motor;
a plurality of electrical conductors and connectors.
2. The BLDC motor controller of Claim 1, wherein one integrated module is a control module for phase A, one is a control module for phase B, one is a control module for phase C, one is a power supply module and one is a processor module.
3. The BLDC motor controller of Claim 1, wherein one electrical feedback loop is connected to the BLDC motor, the processor module, the control module for phase A, the control module for phase B and the control module for phase C.
4. The BLDC motor controller of Claim 1, wherein one electrical feedback loop is connected to the BLDC motor, the control module for phase A, the control module for phase B, the control module for phase C and the feedback circuitry. It may also be connected to the DC source for the control modules for phase A, phase B and phase C.
5. The BLDC motor controller of Claim 1, wherein both electrical feedback loops are connected to the phase windings of the BLDC motor.
6. The BLDC motor controller of Claim 1, wherein the power supply module is electrically connected to the processor module, the control module for phase A, the control module for phase B and the control module for phase C.

7. The BLDC motor controller of Claim 1, wherein the processor module is electrically connected to the power supply module, the control module for phase A, the control module for phase B and the control module for phase C.
8. The BLDC motor controller of Claim 1, wherein the control module for phase A is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
9. The BLDC motor controller of Claim 1, wherein the control module for phase B is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
10. The BLDC motor controller of Claim 1, wherein the control module for phase C is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
11. The BLDC motor controller of Claim 1, wherein the processor module contains three optically controlled switches.



(12) **DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION**

(13) **A1**

(22) Date de dépôt/Filing Date: 2016/10/21

(41) Mise à la disp. pub./Open to Public Insp.: 2018/04/21

(51) Cl.Int./Int.Cl. *H02K 29/08* (2006.01),
H02K 11/215 (2016.01), *H02P 6/00* (2016.01)

(71) Demandeur/Applicant:
ANDERSON, BUSTER W., CA

(72) Inventeur/Inventor:
ANDERSON, BUSTER W., CA

(74) Agent: NA

(54) Titre : SOMMAIRE FONCTIONNEL D'UN SYSTEME D'ENTRAINEMENT MOTEUR BLDC COUPLE OPTIQUEMENT
A BOUCLE FERMEE BRANDT

(54) Title: BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR DRIVE SYSTEM OPERATIONAL
SUMMARY

(57) **Abrégé/Abstract:**

The Brandt Closed Loop Optically Coupled BLDC Motor Drive System is designed to maximize the performance of the motor by harvesting the energy losses associated with the unused back EMF. The system employs two distinct feedback loops. One loop continually gathers rotor position information to determine the current speed and adjusts the width of PWM signal via optical coupling that controls the switching of the field windings. This in turn increases or decreases the motor speed. A second feedback loop gathers the back EMF from the field, rectifies it and adds it to the DC source that sets the signal magnitude of the PWM signal applied to the field or is applied directly to motor output. This adjusts the motor speed, output and thus efficiency. Therefore, system performance is optimized for each state of operation. In addition to these automatic control loops, the system also includes three manual adjustments that provide additional flexibility and control over motor operation.



ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Date : 2016/10/28

CERTIFICAT DE DÉPÔT FILING CERTIFICATE

N° de demande/Application No. : 2,946,108

Date de dépôt/Filing Date : 2016/10/21

Votre référence/
Your Reference :

Date prévue de mise à la disponibilité du public /
Expected Open to Public Inspection Date : 2018/04/21

Titre de l'invention/
Title of Invention : BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR DRIVE SYSTEM
OPERATIONAL SUMMARY

Demandeur(s)/Applicant(s) : ANDERSON, BUSTER W.

Inventeur(s)/Inventor(s) : ANDERSON, BUSTER W.

La requête d'examen et la taxe prescrite n'avaient pas été soumises au moment de la création du certificat de dépôt. Veuillez consulter le site Web de l'OPIIC pour obtenir plus de renseignements.

Avis spécial

Veillez noter que la taxe annuelle qui permet de maintenir votre demande en état est applicable tous les ans à compter du 2^e anniversaire jusqu'au 20^e et vous devez la payer au plus tard à la date d'anniversaire. L'omission de payer cette taxe avant l'expiration du délai fixé résultera en l'abandon de votre demande.

The request for examination and the prescribed fee has not been submitted when the filing certificate was created. Please visit CIPO's website for more information.

Special Notice

You are reminded that annual fees to maintain your application are needed for each one-year period between the 2nd and 20th anniversaries, and must be paid on or before each anniversary. Failure to pay within the prescribed time limit will lead to abandonment of your application.

Commissaire aux brevets/Commissioner of Patents



ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Date : 2018/12/03

AVIS D'ABANDON NOTICE OF ABANDONMENT

N° de demande/Application No. : 2,946,108

Classification : H02K 29/08

Votre référence/Your Reference :

Propriétaire(s)/Owner(s) : ANDERSON, BUSTER W.

Date d'abandon/ : 2018/10/22
Date of Abandonment

La demande susmentionnée est réputée abandonnée en vertu de l'alinéa 73(1)(c) de la Loi sur les brevets en raison de l'absence du paiement de la taxe pour le maintien en état de cette demande.

Il est possible de rétablir la demande conformément au paragraphe 73(3) de la Loi sur les brevets à condition de déposer une requête de rétablissement, de payer la taxe pour le maintien et la taxe applicable au rétablissement avant la fin du délai de douze mois suivant la date d'abandon ci-dessus.

Veuillez ne pas tenir compte de cet avis si vous avez déjà acquitté la taxe ci-dessus.

Pour de plus amples renseignements, veuillez communiquer avec l'Office de la propriété intellectuelle du Canada.

The above application is deemed to be abandoned pursuant to a paragraph 73(1)(c) of the Patent Act for failure to pay maintenance fee.

The application may be reinstated pursuant to subsection 73(3) of the Patent Act by making a request for reinstatement, paying the maintenance fee, and paying the fee for reinstatement before the expiry of the twelve-month period after the date of abandonment referred to above.

Please disregard this notice if you have already paid the above maintenance fee.

Should you require more information, please do not hesitate to contact the Canadian Intellectual Property Office.

Commissaire aux brevets/Commissioner of Patents



ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Date : 2018/07/24

AVIS DE RAPPEL : TAXES DE MAINTIEN NOTICE: MAINTENANCE FEE REMINDER

N° de demande ou N° de brevet/
Patent Application/Patent No. : 2,946,108
Date de dépôt/Filing Date : 2016/10/21
Montant dû/Amount Due : \$50.00
Date limite de paiement/
Payment Due Date : 2018/10/21

La présente a pour but de vous rappeler que vous devez payer le montant dû indiqué ci-dessus pour maintenir votre demande de brevet en vigueur ou pour maintenir les droits conférés par votre brevet.

Une taxe de maintien est payable au plus tard à l'anniversaire de la date de dépôt de la demande et ce, à compter du deuxième anniversaire. La taxe doit être reçue au plus tard à la «**DATE LIMITE DE PAIEMENT**» indiquée ci-dessus.

Vous pouvez payer annuellement ou à l'avance les taxes de maintien pour un nombre d'années donné. Vous pouvez économiser du temps en payant en ligne; vos paiements seront enregistrés et confirmés le jour même. Pour plus de renseignements sur la méthode de paiement en ligne, rendez-vous au : www.opic.ic.gc.ca/taxesdemaintien.

Il vous incombe d'acquitter la taxe chaque année au plus tard à la date limite.

L'omission de payer les taxes de maintien résultera en l'abandon de votre demande de brevet ou en la mise en instance de péremption de votre brevet. Veuillez ne pas tenir compte de cet avis si vous avez déjà acquitté la taxe de maintien ci-dessus.

Pour de plus amples renseignements, veuillez communiquer avec l'Office de la propriété intellectuelle du Canada.

Cet avis de rappel s'applique à l'année en cours seulement et non aux taxes de maintien non payées des années antérieures.

You are reminded that the above mentioned maintenance fee must be paid to maintain your patent application in effect or maintain the rights accorded by your patent.

A maintenance fee must be paid on or before each anniversary of the date of filing of the application, starting with the second anniversary. This payment must be received on or before the "**PAYMENT DUE DATE**" indicated above.

The maintenance fees can be paid yearly or for any number of years in advance. You can save time by paying online; your payment will be recorded and acknowledged the same day. For online payment information, visit www.cipo.gc.ca/maintenancfees

It is your responsibility to ensure that the payment is made every year on or before the due date.

Failure to pay maintenance fees will lead to the abandonment of your application for patent or render your patent in "an about to lapse" state.

Please disregard this notice if you have already paid the above maintenance fee.

Should you require more information, please do not hesitate to contact the Canadian Intellectual Property Office.

This reminder notice applies to the current year and not any past Maintenance fee dues.

Commissaire aux brevets/Commissioner of Patents



ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Date : 2019/04/24

DEUXIEME AVIS DE RAPPEL : TAXES DE MAINTIEN
SECOND NOTICE: MAINTENANCE FEE REMINDER

**N° de demande ou N° de brevet/
Patent Application/Patent No.** : 2,946,108
Date de dépôt/Filing Date : 2016/10/21
Montant dû/Amount Due : \$250.00
**Date limite de paiement/
Payment Due Date** : 2019/10/21

Il est à noter que les frais ci-haut mentionnés doivent être payés afin de maintenir votre demande de brevet en vigueur ou pour maintenir les droits accordés à votre brevet sous l'article 27.1 de la loi des brevets.

Ces frais comprennent la taxe de maintien de l'année dernière et la taxe de rétablissement.

Ce paiement doit être reçu le ou avant la «**DATE LIMITE DE PAIEMENT**» ci-haut mentionnée. L'omission de payer les frais de maintien aura pour effet l'abandon définitif de la demande de brevet ou le brevet sera périmé.

Veillez ne pas tenir compte du présent avis si vous avez déjà acquitté la taxe de maintien ci-dessus.

Pour de plus amples renseignements, veuillez communiquer avec l'Office de la propriété intellectuelle du Canada.

You are reminded that the above specified fee must be paid to maintain your patent application in force or the rights accorded by your patent under Section 27.1 of the Patent Law.

This fee includes the maintenance fee for last year plus the reinstatement fee.

This payment must be received on or before the "**PAYMENT DUE DATE**" indicated above. Failure to pay the maintenance fee will make your application irrevocably abandoned or render your patent in a lapsed state.

Please disregard this notice if you have already paid the above maintenance fee.

Should you require more information, please do not hesitate to contact the Canadian Intellectual Property Office.

Commissaire aux brevets/Commissioner of Patents



ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Date : 2019/07/23

AVIS DE RAPPEL : TAXES DE MAINTIEN NOTICE: MAINTENANCE FEE REMINDER

N° de demande ou N° de brevet/
Patent Application/Patent No. : 2,946,108
Date de dépôt/Filing Date : 2016/10/21
Montant dû/Amount Due : \$50.00
Date limite de paiement/
Payment Due Date : 2019/10/21

La présente a pour but de vous rappeler que vous devez payer le montant dû indiqué ci-dessus pour maintenir votre demande de brevet en vigueur ou pour maintenir les droits conférés par votre brevet.

Une taxe de maintien est payable au plus tard à l'anniversaire de la date de dépôt de la demande et ce, à compter du deuxième anniversaire. La taxe doit être reçue au plus tard à la «**DATE LIMITE DE PAIEMENT**» indiquée ci-dessus.

Vous pouvez payer annuellement ou à l'avance les taxes de maintien pour un nombre d'années donné. Vous pouvez économiser du temps en payant en ligne; vos paiements seront enregistrés et confirmés le jour même. Pour plus de renseignements sur la méthode de paiement en ligne, rendez-vous au : www.opic.ic.gc.ca/taxesdemaintien.

Il vous incombe d'acquitter la taxe chaque année au plus tard à la date limite.

L'omission de payer les taxes de maintien résultera en l'abandon de votre demande de brevet ou en la mise en instance de péremption de votre brevet. Veuillez ne pas tenir compte de cet avis si vous avez déjà acquitté la taxe de maintien ci-dessus.

Pour de plus amples renseignements, veuillez communiquer avec l'Office de la propriété intellectuelle du Canada.

Cet avis de rappel s'applique à l'année en cours seulement et non aux taxes de maintien non payées des années antérieures.

You are reminded that the above mentioned maintenance fee must be paid to maintain your patent application in effect or maintain the rights accorded by your patent.

A maintenance fee must be paid on or before each anniversary of the date of filing of the application, starting with the second anniversary. This payment must be received on or before the "**PAYMENT DUE DATE**" indicated above.

The maintenance fees can be paid yearly or for any number of years in advance. You can save time by paying online; your payment will be recorded and acknowledged the same day. For online payment information, visit www.cipo.ic.gc.ca/maintenancfees

It is your responsibility to ensure that the payment is made every year on or before the due date.

Failure to pay maintenance fees will lead to the abandonment of your application for patent or render your patent in "an about to lapse" state.

Please disregard this notice if you have already paid the above maintenance fee.

Should you require more information, please do not hesitate to contact the Canadian Intellectual Property Office.

This reminder notice applies to the current year and not any past Maintenance fee dues.

Commissaire aux brevets/Commissioner of Patents

3413804

Instruction Letter

Date : October 21, 2016 15:03:34.

Commissioner of Patents
50 Victoria Street
Place du Portage
Phase I
Gatineau, Quebec
Canada
K1A 0C9

E-Commerce

Application Number: New application

Applicant: ANDERSON Buster

Title: Overunity Test RB BLDC Motor



I(we) would like to obtain a patent. Attached with this electronic message (is a copy/are copies) of the following document(s):

FILE NAME: 10hpMachineDrawing.pdf

FILE TYPE: DRAWING

Schematic Controller, Machine Drawings & Windings

FILE NAME: 40hpLaminationColoredYarnWindings.PDF

FILE TYPE: DRAWING

FILE NAME: 40hpMachineDrawing.pdf

FILE TYPE: DRAWING

FILE NAME: RB BLDC Motor Controller Summary.pdf

FILE TYPE: DESCRIPTION

FILE NAME: Schematic Controller.pdf

FILE TYPE: DRAWING

I am including the following fee(s): 200.00. The total fees should amount to: \$200

I wish to correspond via EMail.

Supplemental Instructions are following:

More documents & filed will be added to later.

ANDERSON Buster W
Box 775

SedgewickAlberta
CANADA
T0B 4C0
Tel: 780-3842276
beenergy@telusplanet.net

Transmission identification: Busterzxcv2110144844_1375208149_5840082

Petition for Grant of a Patent

1. The applicant, ANDERSON, Buster W whose complete address is Box 775, Sedgewick, Alberta, CANADA, T0B 4C0, Tel: 780-3842276, Fax: , beenergy@telusplanet.net, requests the grant of a patent for an invention, entitled 'Overunity Test RB BLDC Motor', which is described and claimed in the accompanying specification.

2. This application is a division of application number -----, filed in Canada on -----.

(Not applicable)

3. (1) The applicant is the sole inventor.

(2) The inventor is -----, whose complete address is ----- and the applicant are the legal representative of the inventor.

(Not applicable)

4. The applicant requests priority in respect of the application on the basis of the following previously regularly filed application:

(Not applicable)

5. The applicant appoints -----, whose complete address is ----- as the applicant's representative in Canada, pursuant to section 29 of the Patent Act.

(Not applicable)

6. The applicant appoints ----- whose complete address is -----as the applicant's patent agent.

(Not applicable)

7. The applicant believes that in accordance with the Patent Rules they are entitled to pay fees at the small entity level in respect of this application and in respect of any patent issued on the basis of this application.

8. The applicant requests that Figure No. ----- of the drawing accompany the abstract when it is open to the public inspection under section 10 of the Patent Act or published.

(Not applicable)

/Buster Anderson/

Transmission identification:Busterzxcv2110144844_1375208149_5840082

26 October 2016 (26-10-2016)

ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Application No. : **2,946,108**
Owner : ANDERSON, BUSTER W.
Title : **BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR
DRIVE SYSTEM OPERATIONAL SUMMARY**

COURTESY LETTER

Dear Madam/Sir

Your application for patent has been allotted the above referenced serial number and filing date of 21 October 2016 (21-10-2016).

To avoid a completion fee of \$200.00, the completion requirement(s) set out in section 94 of the *Patent Rules* listed below, must be submitted to the Office.

- an abstract
- a claim or claims

The time limit to provide the requirement(s) listed above is the 15-month period after the filing date of the application or, if a request for priority has been made in respect of the application, the 15-month period after the earliest filing date of any previously regularly filed application on which the request for priority is based.

As the preparation and prosecution of a patent application is quite complex, it is recommended that the inventor should consult a Patent Agent who is trained and registered to practice before the Canadian Patent Office. A list of Registered Patent Agents, practicing in any particular region of Canada, may be obtained free of charge on the CIPO website or by writing to the Commissioner of Patents.

When corresponding with the Office, please refer to the above referenced application number, the name of the applicant or inventor and the title of the invention.

Should you require further information regarding this letter, please contact the undersigned.

For general enquiries, please call our toll-free number 1-866-997-1936 or you can also visit the CIPO website at <http://www.cipo.gc.ca>.

2,946,108

2

René Charbonneau

Patent Formalities and Assignments Analyst

819-635-5903

As per CIPO's Client Service Standards, a response to a telephone enquiry or voice mail should be provided by the end of the next business day. Should you have any questions in regards to this file, please do not hesitate to contact the undersigned; or, in the eventuality the undersigned is not available to take your call, please contact the section's general inquiry line at 819-997-1950.

26 October 2016 (26-10-2016)

ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Application No. : **2,946,108**
Owner : ANDERSON, BUSTER W.
Title : **BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR
DRIVE SYSTEM OPERATIONAL SUMMARY**

Dear Sir/Madam,

Reference is made to your application filed in the Office on 21 October 2016 (21-10-2016).

The Office has noted that the title of the invention identified in the Petition for Grant of a Patent does not correspond to the one specified in the description.

Please be advised that the Office will use the title of the invention as it appears in the description and not the one specified in the Petition for Grant of a Patent.

Should the applicant wish to modify the title of this patent application, a request to do so and an amendment to page 1 of the description as required by paragraph 80(1)(a) of the *Patent Rules* must be submitted.

Your attention is directed to the Practice Notice published in the CPOR on January 27, 2009.

Should you require further assistance, please do not hesitate to contact the undersigned.

Sincerely,

René Charbonneau
Patent Formalities and Assignments Analyst
819-635-5903

As per CIPO's Client Service Standards, a response to a telephone enquiry or voice mail should be provided by the end of the next business day. Should you have any questions in regards to this file, please do not hesitate to contact the undersigned; or, in the eventuality the undersigned is not available to take your call, please contact the section's general inquiry line at 819-997-1950.

26 October 2016 (26-10-2016)

ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Application No. : **2,946,108**
Owner : ANDERSON, BUSTER W.
Title : **BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR
DRIVE SYSTEM OPERATIONAL SUMMARY**

Dear Sir/Madam,

Reference is made to your application filed in the Office on 21 October 2016 (21-10-2016).

The Office has noted that the title of the invention identified in the Petition for Grant of a Patent does not correspond to the one specified in the description.

Please be advised that the Office will use the title of the invention as it appears in the description and not the one specified in the Petition for Grant of a Patent.

Should the applicant wish to modify the title of this patent application, a request to do so and an amendment to page 1 of the description as required by paragraph 80(1)(a) of the *Patent Rules* must be submitted.

Your attention is directed to the Practice Notice published in the CPOR on January 27, 2009.

Should you require further assistance, please do not hesitate to contact the undersigned.

Sincerely,

René Charbonneau
Patent Formalities and Assignments Analyst
819-635-5903

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020

Date : December 5, 2016 17:32:27.

Commissioner of Patents
50 Victoria Street
Place du Portage
Phase I
Gatineau, Quebec
Canada
K1A 0C9



Application Number:2,946,108
Applicant: ANDERSON, BUSTER W.
Title: BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR DRIVE SYSTEM
OPERATIONAL SUMMARY
Reference Number: December 5, 2016

Gerber Files and schematic for updated controller application 2,946,108.

AndersonBusterW
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SedgewickAlberta
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T0B 4C0
Tel:780-384-2276
beenergy@telusplanet.net

Transmission identification:Busterzxcv512172146_1346200578

7 December 2016 (07-12-2016)

ANDERSON, BUSTER W.
BEENERGY@TELUSPLANET.NET

Application No. : **2,946,108**
Owner : ANDERSON, BUSTER W.
Title : **BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR
DRIVE SYSTEM OPERATIONAL SUMMARY**
Classification : H02K 29/08 (2006.01)

Dear Sir/Madam,

Reference is made to your correspondence dated December 5, 2016.

Please note that there was no attachment included with your correspondence.

René Charbonneau
Patent Formalities and Assignments Analyst
819-635-5903

As per CIPO's Client Service Standards, a response to a telephone enquiry or voice mail should be provided by the end of the next business day. Should you have any questions in regards to this file, please do not hesitate to contact the undersigned; or, in the eventuality the undersigned is not available to take your call, please contact the section's general inquiry line at 819-997-1950.

Date : December 6, 2016 20:40:54.

Commissioner of Patents
50 Victoria Street
Place du Portage
Phase I
Gatineau, Quebec
Canada
K1A 0C9



Application Number:2,946,108
Applicant: ANDERSON, BUSTER W.
Title: BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR DRIVE SYSTEM
OPERATIONAL SUMMARY
Reference Number: December 6, 2016

Add this updated pdf schematic for the controller to the Patent Application

Attached are the following documents:
DRAWING: Brandt BLDC Controller System_rev1.pdf
Updated Controller Schematic with links to parts

AndersonBusterW
Box 775
SedgewickAlberta
CANADA
T0B 4C0
Tel:780-384-2276
beenergy@telusplanet.net

Transmission identification:Busterzxcv612203322_1516036460

Brandt Closed Loop Optically Coupled Brushless DC (BLDC) Motor Controller System

SUMMARY:

Brushless DC (BLDC) Motors are used in a number of applications where low noise, highly efficient operation is desired. These motors compare favorably to other DC and AC motors. These motors are controlled by adjusting the field winding voltage/current typically in conjunction with monitoring the rotor position by means of position sensors and tachometers. Although, these motors are very efficient (> 90% in some cases) they do require external power sources to drive the control circuitry and have losses. The losses are mechanical, primarily frictional, and electromagnetic. Frictional losses may be harnessed to aid in cooling the motor; however, electromagnetic losses are typically unaddressed.

The Brandt Closed Loop Optically Coupled BLDC Motor Drive System is designed to harvest the unused electromagnetic energy. The system employs Hall sensors for position sensing, optical switches for phase excitation and a high performance controller IC equipped with top and bottom driver outputs, programmable oscillator, and position sensor decoder. The system separates itself from other drivers by the use of a feedback circuit that captures electromagnetic energy from the field windings. The captured energy is converted to DC and added to the motor power improving the motor's output and increasing its efficiency.

OPERATION:

The Brandt BLDC Controller performs all of the functions of typical controllers; however, it is intended to enhance motor output by utilization of EM energy feedback. Its operation is summarized below.

- **Power Supply Module.**
The power supply module accepts as input the DC source and generates the regulated PCB and IC voltages required throughout the controller system. For the original design, the source voltage is 24VDC, PCB voltage is 15VDC and IC voltages are 12VDC. This module is able to accept an input range of 9V – 36VDC, which provides a degree of flexibility. However, in cases where large source currents are used (i.e. 48V – 96VDC) frontend conversion will be necessary.
- **Phase A, B, and C Controller Modules.**
These modules accept control signals from the processor module that control when the field voltages are switched. It also provides the signal amplification and application of the field winding voltages. These modules employ very fast high current switching devices, which are quite robust (able to withstand 180A surge currents).

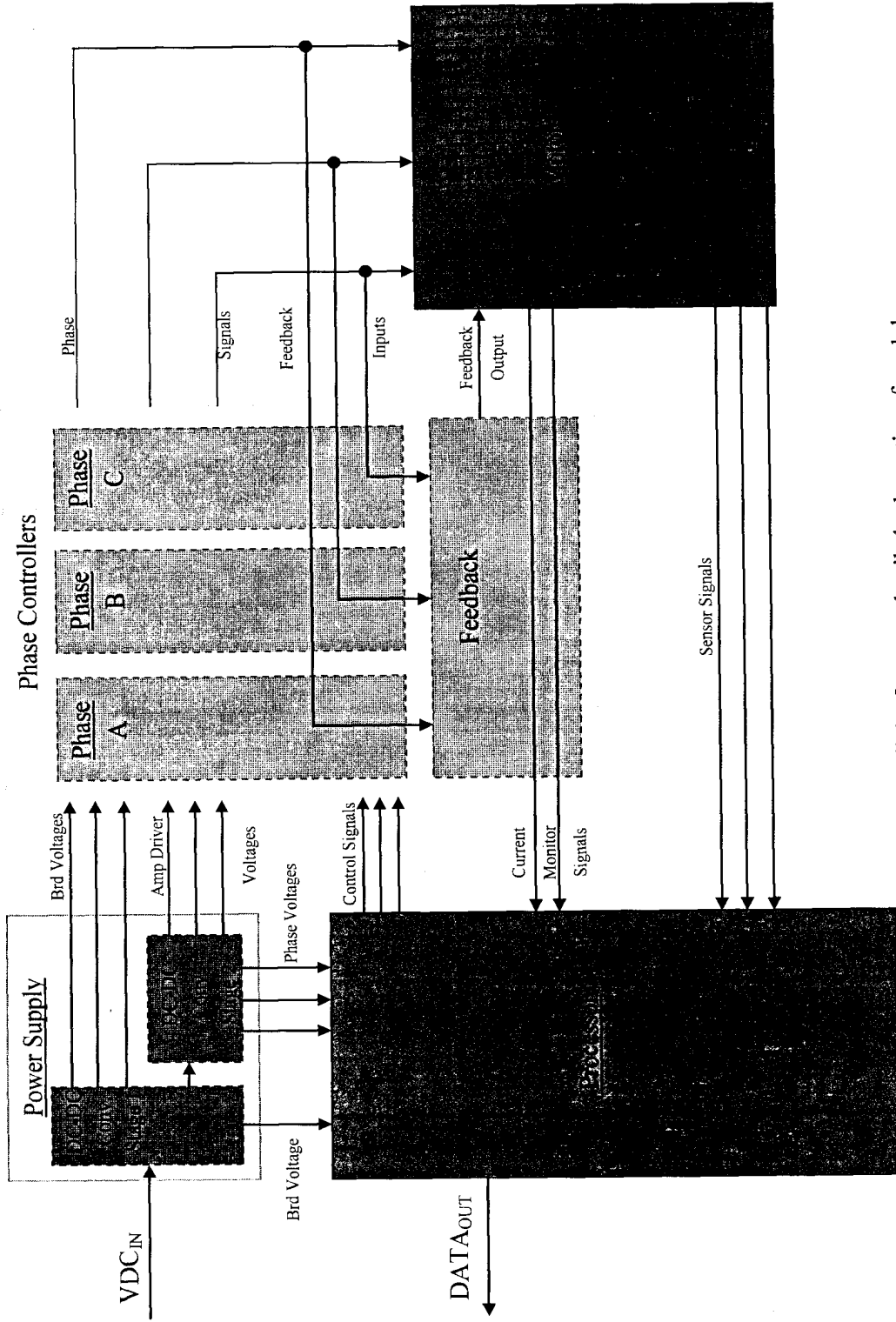
- Processor Module.

The original design employs the ON Semiconductor M33035-D BLDC Controller processor in conjunction with the MC33039-D Closed Loop Speed Control Adapter. These process the input position data from the Hall sensors. The processor determines when field winding switching should occur and the phase signals are excited optically based upon this timing. This module also allows for a number of manual inputs that may be used for speed control, which make this system deployable in a wide range of applications (i.e. vehicles, bikes, and other motorized devices). The processor also generates the data that is transferred to external output devices (i.e. displays, memory).

- Feedback.

The utilization of EM feedback from the motor windings, primarily, separates the Brandt BLDC Controller from other systems. This energy is captured from the windings and converted to a DC voltage, the feedback output, which can be utilized by the motor. The precise means of application is not fixed. The feedback output may simply be added to the load as a DC voltage/current effectively increasing the motor output power. Alternatives are available to the application designer or implementer. It is recommended that the feedback converter be connected directly to the phase modules as indicated by the inclusion of the feedback as part of the phase modules in the block diagram (following page).

BLOCK DIAGRAM:



Click on [links](#) for more detailed schematics of modules.

PARTS LISTS:

Below are the parts lists (BOMs) for the phase controller, power supply and processor modules, and the datasheet for the feedback converter.

- [Power Supply BOM](#)
- [Phase A Controller BOM](#)
- [Phase B Controller BOM](#)
- [Phase C Controller BOM](#)
- [Processor BOM](#)
- [Feedback Converter \(M50100TB400\)](#)

PCB LAYOUTS:

Optimized PCB layouts for the phase controller, power supply and processor modules have been created. These layouts were designed to minimize board size, optimize footprint coverage and reduce trace lengths. You can view these by clicking on the links below.

- [Power Supply PCB Layout](#)
- [Phase A Controller PCB Layout](#)
- [Phase B Controller PCB Layout](#)
- [Phase C Controller PCB Layout](#)
- [Processor PCB Layout](#)

On the block diagram (above) Feedback is shown as a sub-block of the Phase Controllers block. This is done to illustrate the interconnections between the phase controllers and the feedback converter. In fact, the three phase (A, B and C) controllers are separate PCBs that all connect to the feedback converter. The [feedback converter](#) is a self contained device that may be physically placed at any convenient location to facilitate the interconnections between the phase controllers, processor and motor as shown on the block diagram and illustrated on the module schematics.

FABRICATION:

The fabrication files for the modules are given below.

- Power Supply Module
 - [Gerber Files](#)
 - [Drill File](#)
 - [Board Information](#)
 - [Fabrication Specifications](#)
 - [Pick and Place File](#)
- Phase A Controller Module
 - [Gerber Files](#)

- Drill File
- Board Information
- Fabrication Specifications
- Pick and Place File
- Phase B Controller Module
 - Gerber Files
 - Drill File
 - Board Information
 - Fabrication Specifications
 - Pick and Place File
- Phase C Controller Module
 - Gerber Files
 - Drill File
 - Board Information
 - Fabrication Specifications
 - Pick and Place File
- Processor Module
 - Gerber Files
 - Drill File
 - Board Information
 - Fabrication Specifications
 - Pick and Place File

The files above contain all of the data and information to fabricate all of the modules for the system; however, for AutoCAD users, DXF files are included and listed below.

- Power Supply Module
- Phase A Controller Module
- Phase B Controller Module
- Phase C Controller Module
- Processor Module

INSTALLATION:

The design and fabrication files above are for full development of the PCBs and components necessary to implement the Brandt BLDC Controller in a new or existing application. The modules are presented as PCBs without enclosures. This allows the developer to perform detailed component level testing and design custom enclosures that best integrate into the overall product. In this spirit, interconnection hardware is not included. However, all of the boards utilize standard and consistent connectors.

Although, it is recommended that the PCBs be implemented described and illustrated in this report and accompanying documents, experienced designers may desire to modify the design by substitute components, etc. In this event, it is highly recommended that the veracity of component parameters be maintained.

SAFETY PRECAUTIONS:

The Brandt BLDC Controller is designed to maximize the energy generation and efficiency for an attached motor. Although, the system is flexible enough to be implemented in a wide range of products with varying power requirements it is capable of generating and operating at significant voltage and current levels that may pose safety concerns. **THEREFORE, IT IS HIGHLY RECOMMENDED THAT NORMAL ELECTRICAL SYSTEM PRECAUTIONS BE IN PLACE WHEN BUILDING, TESTING OR OPERATING THE SYSTEM. THESE INCLUDE THE FOLLOWING:**

- **DO NOT EXCEED STATED PARAMETERS FOR COMPONENTS.**
- **USE PROPER GROUNDING WHENEVER SYSTEM IS ENERGIZED.**
- **USE STANDARD MEASURING DEVICE PROCEDURES.**
- **HAVE ACCESS TO A QUICK-DISCONNECT FOR DEENERGIZING THE SYSTEM.**

PERFORMANCE:

Very impressive results have been reported for this driver system and the system is currently being analyzed via simulation and experimentation to verify the expected results as well as define specific ranges of operations that are applicable for different deployments.

SUPPORT:

Please contact the distributor of this package for further information or support with your development.

008
/ 20

Date : December 15, 2016 22:47:05.

Commissioner of Patents
50 Victoria Street
Place du Portage
Phase I
Gatineau, Quebec
Canada
K1A 0C9



Application Number:2,946,108
Applicant: ANDERSON, BUSTER W.
Title: BRANDT CLOSED LOOP OPTICALLY COUPLED BLOC MOTORDRIVE SYSTEM
OPERATIONAL SUMMARY
Reference Number: Dec15 Abstract

Abstract, Claims, Description & Drawings attached.

Attached are the following documents:
ABSTRACT: Abstract_RB Controller.pdf
Abstract

CLAIM: Claims_RB Controller.pdf
Claims

DRAWING: Drawings_RB Controller.pdf
Drawings

: Description_RB Controller.pdf
Description

AndersonBusterW
Box 775
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T0B 4C0
Tel:780-384-2276
beenergy@telusplanet.net

Transmission identification:Busterzxcv1512223247_1683798081

ABSTRACT

The Brandt Closed Loop Optically Coupled BLDC Motor Drive System is designed to maximize the performance of the motor by harvesting the energy losses associated with the unused back EMF. The system employs two distinct feedback loops. One loop continually gathers rotor position information to determine the current speed and adjusts the width of PWM signal via optical coupling that controls the switching of the field windings. This in turn increases or decreases the motor speed. A second feedback loop gathers the back EMF from the field, rectifies it and adds it to the DC source that sets the signal magnitude of the PWM signal applied to the field or is applied directly to motor output. This adjusts the motor speed, output and thus efficiency. Therefore, system performance is optimized for each state of operation. In addition to these automatic control loops, the system also includes three manual adjustments that provide additional flexibility and control over motor operation.

CLAIMS

"The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:"

1. The present invention is a BLDC motor controller comprising;
five integrated modules;
two electrical feedback loops;
at least one BLDC motor;
a plurality of electrical conductors and connectors.
2. The BLDC motor controller of Claim 1, wherein one integrated module is a control module for phase A, one is a control module for phase B, one is a control module for phase C, one is a power supply module and one is a processor module.
3. The BLDC motor controller of Claim 1, wherein one electrical feedback loop is connected to the BLDC motor, the processor module, the control module for phase A, the control module for phase B and the control module for phase C.
4. The BLDC motor controller of Claim 1, wherein one electrical feedback loop is connected to the BLDC motor, the control module for phase A, the control module for phase B, the control module for phase C and the feedback circuitry. It may also be connected to the DC source for the control modules for phase A, phase B and phase C.
5. The BLDC motor controller of Claim 1, wherein both electrical feedback loops are connected to the phase windings of the BLDC motor.
6. The BLDC motor controller of Claim 1, wherein the power supply module is electrically connected to the processor module, the control module for phase A, the control module for phase B and the control module for phase C.

7. The BLDC motor controller of Claim 1, wherein the processor module is electrically connected to the power supply module, the control module for phase A, the control module for phase B and the control module for phase C.
8. The BLDC motor controller of Claim 1, wherein the control module for phase A is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
9. The BLDC motor controller of Claim 1, wherein the control module for phase B is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
10. The BLDC motor controller of Claim 1, wherein the control module for phase C is electrically connected to the processor module, the power supply module, the feedback circuitry and the BLDC motor.
11. The BLDC motor controller of Claim 1, wherein the processor module contains three optically controlled switches.

022

Date : December 18, 2016 17:41:01.

Commissioner of Patents
50 Victoria Street
Place du Portage
Phase I
Gatineau, Quebec
Canada
K1A 0C9



Application Number:2,946,108
Applicant: ANDERSON, BUSTER W.
Title: BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR DRIVE SYSTEM
OPERATIONAL SUMMARY
Reference Number: December 18 Search Results

Preliminary Search Results attached.Is there any more information that needs to be sent for the patent application?Also can the application be made public and if so what steps need to be done for that?

AndersonBusterW.
Box 775
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T0B 4C0
Tel:780-384-2276
beenergy@telusplanet.net

Transmission identification:Busterzxcv1812173016_1941025147

* no attachments received

ANDERSON, BUSTER W.
BOX 775
SEDGEWICK Alberta
T0B 4C0

25 July 2019 (25-07-2019)

Application No. : **2,946,108**
Owner : ANDERSON, BUSTER W.
Title : **BRANDT CLOSED LOOP OPTICALLY COUPLED BLDC MOTOR
DRIVE SYSTEM OPERATIONAL SUMMARY**
Classification : H02K 29/08 (2006.01)

Dear Client,

Our files indicate that you wish for the Patent Office to correspond with you by e-mail; however when we recently tried to send you an official correspondence, we received notification that the e-mail address provided is not valid (see message, attached).

We have updated your file to indicate the preferred method of correspondence as regular mail. If you would prefer to receive correspondence by e-mail, please send us a valid e-mail address and a request to change the method of correspondence.

Should you require any further information or assistance, please do not hesitate to contact the undersigned.

Melissa Grainger
Maintenance Fees Analyst
819-956-7049

As per CIPO's Client Service Standards, a response to a telephone enquiry or voice mail should be provided by the end of the next business day. Should you have any questions in regards to this file, please do not hesitate to contact the undersigned; or, in the eventuality the undersigned is not available to take your call, please contact the section's general inquiry line at 819-956-7049.