KOLLMORGEN

Installation and Service Manual

SBD4/X SERIES

P.W.M. Motor Controllers

M-8508 ISSUE 7

THANK YOU!

KOLLMORGEN

Motion Technologies Group

Thank you and congratulations for choosing Industrial Drives' servo products for your motion control requirements. We seek to provide our customers with quality products, excellent support and outstanding value. In an effort to provide you with dependable and useful documentation, we offer you an opportunity to critique this manual with your comments and suggestions. Your feedback on this reader comments form is very important to us. Please answer the questions below and return the form to:

INDUSTRIAL DRIVES - **Technical Manual Department**
201 Rock Road
Radford, VA 24141
U.S.A.
FAX: 540/731/0847

Name:_____ Title:_____

Company:_____

Street Address:_____

City:_____ State:_____ Zip:_____

Telephone:_____ Fax:_____

Product:_____

Manual Part Number:_____

Please check the rating that best represents your opinion on each topic.

		Excellent	Good	Fair	Poor
1.	Overall clarity and readability.	❑	❑	❑	❑
2.	Organization of the manual.	❑	❑	❑	❑
3.	Information completeness.	❑	❑	❑	❑
4.	Information accuracy.	❑	❑	❑	❑
5.	Installation procedures.	❑	❑	❑	❑
6.	Ability to quickly find information you need.	❑	❑	❑	❑
7.	Graphics.	❑	❑	❑	❑
8.	Figures (usefulness).	❑	❑	❑	❑
9.	Tables (usefulness).	❑	❑	❑	❑
10.	Overall rating of this manual.	❑	❑	❑	❑

Please list any errors._____

What did you like least about this manual?_____

What did you like most about this manual?_____

How would you improve this manual?_____

Signature:_____ Date:_____

KOLLMORGEN

Motion Technologies Group

YOUR SINGLE SOURCE FOR SERVO SERVICE & TRAINING

On Motors and Drives Manufactured by
Kollmorgen Industrial Drives and
Kollmorgen PMI Motion Technologies

BASIC SERVICES

- Factory Representatives to support you by phone with the latest information and documentation.
- On-Site Service to support and return critical systems to operation.
- On-Site Training in *Service, Repair and Troubleshooting* with the latest documentation and information.
- Service Spares and Repairs through our Aftermarket Group.
- A complete Service Package to provide your company with a Total Service Solution.
- Fast Customer Response and Superior Quality Service.

Jerry Hill
MANAGER,
FIELD SERVICE

Fax: 540-731-0847

CALL KOLLMORGEN FOR YOUR SERVICE AND TRAINING NEEDS

540-633-3109

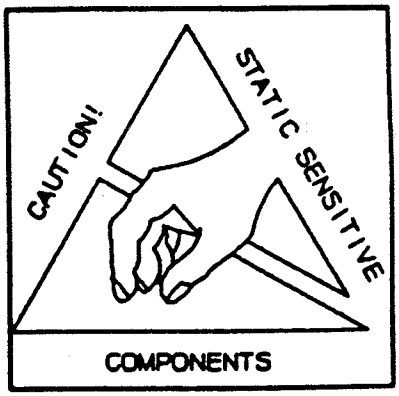
Dave Conner
MANAGER,
AFTERMARKET

Fax: 540-633-4165

European Community (EC) Declaration of Conformity

We, Kollmorgen Corporation Industrial Drives Division, 201 Rock Road, Radford, Virginia USA; declare under sole responsibility that this equipment is exclusively designed for incorporation in another machine. The operation of this equipment is submitted to the conformity of the machine in which it is incorporated, following the provisions of the EC Electro-Magnetic Compatibility (EMC) directive 89/392/EEC.

THE ELECTRONIC COMPONENTS IN THIS AMPLIFIER ARE STATIC SENSITIVE. USE PROPER PROCEDURES WHEN HANDLING COMPONENT BOARDS.



INSTALLATION AND SERVICE MANUAL

SBD4/X SERIES
P.W.M. MOTOR CONTROLLERS
M-8508, Issue 7

NOTICE:

Upon receipt of the amplifier, inspect the components and ensure that no damage has occurred in shipment. If damage has occurred, notify the carrier at once.

WARNING:

DANGEROUS VOLTAGES, CURRENTS, TEMPERATURES, AND ENERGY LEVELS EXIST IN THIS PRODUCT AND IN THE ASSOCIATED SERVO MOTOR(S). EXTREME CAUTION SHOULD BE EXERCISED IN THE APPLICATION OF THIS EQUIPMENT. ONLY QUALIFIED INDIVIDUALS SHOULD ATTEMPT TO INSTALL, SET-UP, AND OPERATE THIS EQUIPMENT.

WARNING:

INCORRECT MOTOR, TACH AND/OR RESOLVER WIRING CAN CAUSE ERRATIC OR RUNAWAY MOTOR OPERATION.

SAFETY FIRST

ONLY QUALIFIED PERSONNEL SHOULD WORK WITH THIS EQUIPMENT.

THE MOTOR THERMOSTAT IS AN AUTOMATIC RESETTING DEVICE AND WHEN APPLICABLE, MOST DEFINITELY SHOULD BE CONNECTED INTO A LATCHED (LOCKED-OUT) POWER DOWN TYPE CIRCUIT.

THE MOTOR OVERLOAD RELAY (CUSTOMER FURNISHED), IF SET TO THE AUTOMATIC MODE, SHOULD BE USED IN A LATCHED POWER DOWN TYPE CIRCUIT. THIS OVERLOAD DEVICE IS NORMALLY SET TO THE MANUAL MODE WHEN SHIPPED FROM INDUSTRIAL DRIVES.

PLEASE CHECK THE MOTOR OVERLOAD DEVICE TO INSURE THAT THE DEVICE IS IN THE MANUAL MODE.

DANGEROUS POWER LEVELS EXIST IN THIS EQUIPMENT. EXTREME CARE SHOULD BE EXERCISED WHEN INSTALLING TROUBLESHOOTING OR OTHERWISE WORKING WITH THE EQUIPMENT. DURING THE INITIAL "START-UP", BE PREPARED TO REMOVE THE MAIN POWER IF A MECHANICAL OR ELECTRICAL PROBLEM OCCURS. IF POSSIBLE, THE INITIAL "START-UP" OF THE EQUIPMENT SHOULD BE PERFORMED WITH THE MOTOR(S) DECOUPLED FROM ANY MACHINE COMPONENTS. IF THIS IS NOT PRACTICAL, PLEASE ENSURE THAT ALL LIMIT SWITCHES AND OTHER SAFETY SHUT DOWN DEVICES ARE IN PLACE AND OPERATIONAL.

THE INFORMATION FOUND IN THIS INSTALLATION AND SERVICE MANUAL IS UP-DATED FREQUENTLY DUE TO PRODUCT IMPROVEMENTS, ETC., AND MAY NOT CONFORM IN EVERY RESPECT TO FORMER VERSIONS OF THE EQUIPMENT IN THE FIELD.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF DRAWINGS

SBF(A)
SINGLE BOARD FRAME ASSEMBLY
MODEL NUMBER SCHEME
Example: SBF(A) B/C-D-EGH

Refer to Figure 1

SBF . . . . . Single Board Frame

A . . . . . Power Supply Option

P . . . . . Main Bus and Logic Power Supplies

H . . . . . Main Bus Power Supply Only

L . . . . . Logic Power Supply Only

B . . . . . Generation

- 1 . . . . . SBF Accepts Only 2" SBDs
- 3 . . . . . SFB Accepts 2", 4", and 6" SBDs

C . . . . . Axis Spacing

- 2 . . . . . 2" Spacing
- 4 . . . . . 4" Spacing
- 6 . . . . . 6" Spacing
- R . . . . . Regeneration Option 2" Spacing

D - 48,60 . . . . . Continuous Current Rating

E . . . . . Main D.C. Bus Voltage Rating

- 1 160
- 2 225

G . . . . . Phase Option

- 1 . . . . . Single Phase Input Power
- 3 . . . . . Three-Phase Input Power

H . . . . . Other Options

- 000 . . . . . No Option

To create a Single Board Multi-Axis system from the SBF(A) Assembly, the appropriate Single Board Drive (Amplifier; SBD2 or SBD4, etc.) dimensions must be considered. Also, if a SBR1 (Single Board Regeneration Module is required), its dimensions must be considered.

Example: SBFP3/642R-48-23000

Interpretation of the above model number reveals the following:

P) The SBF contains a Main Bus and Logic Power Supply

3) The SBF is a 3rd Generation Single Board Frame Assembly

*624R) The SBF contains one 6" SBD4, one 4" SBD4, one 2" SBD2, and a SRB1 Regeneration Module

48) The SBF Main Bus Power Supply is rated at 48 amps continuous

2) The SBF Main Bus Power Supply is rated at 225 volts

3) The SBF input power is from a 3 phase source

000) There are no options

*NOTE: The SBD4 amplifiers are rated at 30, 45, and 60 amps continuous. The 30 and 45 amp units are 4" packages. The 60 amp unit is a 6" package (covered in Installation and Service Manual, M-8508). The SBD4 amplifiers may be mounted in the SBF "Single Board Frame" assembly or mounted as stand-alone modules.

The SBD2 amplifiers are rated at 01, 06, 10, 16, and 20 amps continuous and are all 2" packages (covered in Installation and Service Manual M-8404). The SBD2 amplifiers may be mounted in the SBF "Single Board Frame" assembly or mounted as stand-alone modules.

The SB(R) 1 Regeneration Module is a 2" package. It may be mounted in a SBF "Single Board Frame" assembly or mounted as a stand-alone unit.

The SBP(R)1 Power Supply with Optional Regeneration Module may be mounted as a stand-alone unit only.

SBD4
SINGLE BOARD DRIVE (AMPLIFIER)

MODEL NUMBER SCHEME
Example: SBDA-B-CD-E/F-G

Refer to Figures 2 and 3

SBD ..... Single Board Drive (Amplifier)

A - 4 ..... Generation

B - 30,45,60 ..... Continuous Current Rating

C ..... Standard Maximum Output Voltage

0 ..... 48 (Battery Source)

2 225

D ..... Option

101 ..... O.K. to Enable & Enabled Input Relay Contacts and Precision I^2t Foldback Circuit

102 ..... Same as 101, but with Direction Limits

103 ..... Same as 101, but with Tach Loss Circuit

105 ..... Same as 101, but with low drift op amps

111 ..... Same as 101, but with Dual Compensation Limits

112 ..... Same as 111, but with Direction Limits

E ..... Motor Compensation Code

F ..... Compensation Voltage: 90,120,160,180 or 225

G ..... Compensation Current: 30,45,60

NOTE:

1) All SBD4 units operate at a 5 KHZ switching frequency.

2) SBD4-XX-0XXX compensated to operate on Bus Voltages of 24 to 48 volts, when powered from a battery source will have their under volts fault latches set to trip at approximately 15 volts and their over volts fault latches set to trip at approximately 140 volts.

3) SBD4-XX-1XXX amplifiers compensated to operate on Bus Voltages of 80 to 225 volts, when powered from a 225 vdc supply, will have their under volts fault latches set to trip at approximately 70 volts and their over volts fault latches set to trip at approximately 300 volts.

SBR1
SINGLE BOARD REGENERATION MODULE

MODEL NUMBER SCHEME
Example: SB(A) B-C-E

Refer to Figure 8

SB ..... Single Board (Regen Module)

A - ..... Regeneration Only

B - ..... Generation

C - ..... Options

1000 ..... Standard 160 Volt Unit

2000 ..... Standard 225 Volt Unit

E - ..... D.C. Bus Level

160 ..... 160 Volt Regulation

225 ..... 225 Volt Regulation

Sometimes, this module will be combined with the SBP1 Power Supply Module to form the SBP(R)1 Module, shown in Figures 10 and 11.

SBP(R)1
SINGLE BOARD POWER SUPPLY AND REGENERATION MODULE

MODEL NUMBER SCHEME
Example: SB(A) (R) B-C-EGH

Refer to Figures 9,10,11, and 12

SB ..... Single Board (P.S. Regen Module)

A - ..... Power Supply Option

P ..... Main Bus and Logic Power Supplies

H ..... Main Bus Power Supply Only

L ..... Logic Power Supply Only

R ..... Regeneration Module Option

B - 1 ..... Generation

C - 15,25,48 ..... Continuous Current Rating

E ..... Main D.C. Bus Voltage Output

1 160
2 225

G ..... Phase Option

1 ..... Single Phase Input Power
3 ..... Three Phase Input Power

H ..... Cooling Option

000 ..... With Fan
001 ..... Without Fan

Sometimes, this Stand Alone module will be combined with the SBR1 Regeneration, shown in Figure 8, to form the SBP(R)1 Module, shown in Figures 10 and 11.

1.0 AN IMPORTANT REMINDER

This service and installation manual is a general document and is applicable to the entire SBD4 product line. However, since these motor controllers are interfaced with motors of varying sizes with different operating characteristics such as internal resistance, inductance, rotor inertia, etc., the complete model number of these amplifiers will vary more or less with the motors they are made compatible with. Thus, after an amplifier is mated with a particular motor to form a complete rate loop system, the model number applied to the amplifier nameplate is in reality the model number for the system.

CAUTION:

The Test Limits and Modification Sheet (TL) is a specific document and is applicable ONLY to individual systems or axis sections.

The TL sheet contains such information as maximum operating speed, peak current limits, and the component compensation values (located on the COMP 2 or COMP TL Compensation Card) which make a particular amplifier compatible with the motor.

The TL Sheet will be found in the inside pocket of the front cover of the manual shipped with each amplifier package. Some package may contain more than one motor control section to form a multi-axis drive package. In such cases, there will be as many TL Sheets as there are various types of motors.

2.0 DESCRIPTION

The SBD (Single Board Drive) pulse-width-modulation servo amplifiers are offered in a basic "building block" concept. Designed and manufactured by INDUSTRIAL DRIVES to offer versatility to the market place.

With exception of the power supplies, each SBD module is itself a complete motor controller. The SBD family of motor controllers are offered in several sizes and configurations rated from 6 to 60 amps continuous. One 19" rack mounted SBD system can operate up to 7 axes.

The stand-alone feature of these SBD modules offer alternative packaging, eliminating the need for a frame assembly. Amplifier boards, power supply, and regeneration module are all designed to be stand-alone or rack mounted modules.

2.1 Package Options

SBD4 — Single Board Drive Amplifier
Stand Alone Motor Controller
Refer to Figure 2 and Drawing C-81336

SBPR1 — Single Board Power Supply with Regeneration Board
Stand Alone Main Bus Supply, Logic Bus Supply, and Regeneration Option

Refer to Figures 9, 10, 11, Drawings C-80451, C-80636, and C-81373

SBP1 — Single Board Power Supply
Stand Alone Main Bus Supply and Logic Bus Supply
(Same as SBPR1 except without Regeneration Option)

SBH1 — Single Board Power Supply
Stand Alone Main Bus Supply ONLY
(Same as SBPR1 except without Logic Bus Supply and Regeneration Option)

SBR1 — Single Board Regeneration Module ONLY
Refer to Figure 8

SBFP3/X — Single Board Frame Assembly

May contain up to 7 Single Board Drive Amplifiers with Main Bus Supply and Logic Bus Supply. However, the maximum number of amplifiers contained in the frame assembly depends on amplifier ratings and configurations.

Refer to Figure 1, Drawing C-80717 and C-81373

SBFH3/X — Single Board Frame Assembly
(Same as SBFP3/X except it does not have Logic Bus Supply)

Refer to Drawing C-81119

2.2 Features

The SBD modules are fully protected against a variety of fault conditions for improved reliability:

1. Overcurrent Protection
    a. Motor line short to ground
    b. Short across motor terminals
    c. Motor peak current foldback

2. Overvoltage Protection
    a. Application of excessive power bus
    b. Excessive power bus pump-up due to regeneration

3. Undervoltage Protection
    a. Insufficient power bus voltage
    b. Loss of ± 12 V DC control voltage

4. Thermal Shutdown Protection
    a. Excessive heatsink temperature

5. Overspeed Shutdown Protection
    a. Excessive motor speed

2.3 Specifications

SPECIFICATIONS	
Continuous Current	30, 45, 60 amps
Peak Current	60, 90, 120 amps
DC Bus Voltage	48 to 225 volts
Operating Temperature	0 to 50° C
Input Impedance	20K min.
Bandwidth	200 Hz
D.C. Control Voltage	± 12 volts
Control Current	± 0.60 amps (30-60 amp Units)
Speed Scale Factor	± 9 volts
Form Factor	1.01

3.0 MOUNTING

Refer to the appropriate Outline and Dimension Drawing.

The SBD motor control modules may be individually mounted as single-axis motor controllers (customer furnished fans) or obtained within a rack to form a multi-axis drive system (refer to Drawing C-80717 for typical system). The regeneration and power supply modules may also be located within the rack panel or may be individually mounted. The power supply and regeneration modules are optionally furnished items. For best reliability, it is recommended that all of the modules be mounted in their vertical up-right position. A minimum air flow of 100 ft. per minute is required across Base Drive Board.

4.0 WIRING

NOTE:

In order to adhere to suitable engineering practices, it is recommended that the control voltage (115 V AC for the ± 12 V bus) be applied first in order to activate the control and fault circuits before applying the main bus.

Reference to the notes on the appropriate System Wiring Diagram will aid in correctly "Wiring the System Up."

The following precautions are recommended:

1. Twist all A.C. leads to minimize electromagnetic emission and pick-up.

2. Avoid running signal leads (shielding recommended) in close proximity to power leads, armature leads, or other sources of electromagnetic noise.

3. Minimize lead lengths as much as practical.

4. Double-check all wiring. Carefully inspect all connections.

5. Connect the SBD wiring according to the appropriate wiring diagram, paying close attention to the grounding scheme.

4.1 Grounding Scheme

Each SBD amplifier common is made via the main bus supply common. The main bus supply common should be connected to the central ground point.

CAUTION:

Individual (stand alone) SBD units or individual frame assemblies should not share ground runs.

When the main bus power supply is furnished in a frame assembly by INDUSTRIAL DRIVES, a single ground wire will be provided.

Connect each individual motor case to the central ground point.

4.2 Power Inputs

Refer to Figure 2, Drawings C-81336, C-81332, and C-81373

The main bus high should be connected to the bus bar of the SBD4 identified as Bus (+). The main bus common should be connected to the bus bar identified as Bus (-).

The control power supply should be connected as shown in Drawing C-81373:

+ 12 Volts DC to LS-1 Common to LS-2
- 12 Volts DC to LS-3

When the power supplies are provided by INDUSTRIAL DRIVES, the 3 phase transformer Y secondary may be connected directly to the diode bridge of the main power supply without regard to line phasing (refer to Frame Assembly Schematic C-81373 and Figure 1).

A 115 V AC source must be connected to the SBD1-PS1 (± 12 volt power supply card) connector C14 at pins P & R (refer to Drawings C-81373, C-80132-1, Figures 1 and 12).

4.3 Motor and Tachometer Connections

Refer to Figure 2 and Drawing C-81332

The tachometer leads should be a shielded pair and should be terminated at I/0 connector Pins 2 and 3.

The motor armature leads should be twisted when possible and should be terminated at the motor bus bars identified as MH and ML.

CAUTION:

To avoid runaway, the motor and tach must be phased properly.

Before applying power to the SBD amplifier(s), make the following servo polarity check.

With a voltmeter on a sensitive VDC scale (3 volts or so), place the black probe on motor bus bar identified as ML (motor low). Place the red probe on motor bus bar identified as MH (motor high). Have an assistant rotate the motor shaft and note the polarity indicated by the meter.

Next, place the black probe on I/0 connector pin 2 and the red probe on pin 3 (these pins are accessible at the back of the board connector). Have the assistant rotate the motor shaft once again in the same direction and note the polarity indicated by the meter is opposite that of the previous step; if not, reverse the tach or the motor leads.

After applying power and the system is brought "on line" if the motor moves in the wrong direction, remove power and reverse both motor and tach leads.

4.4 Signal Inputs/Outputs and Modes of Operation

Terminations to the I/0 connector:

The TACHOMETER FEEDBACK SIGNAL is terminated at pin 3 with respect to pin 2. This signal (voltage) level is proportional to speed and is derived from an integral tachometer within the motor. There is a direct relationship between this voltage level and the actual motor speed. Refer to the motor data for the VOLTAGE SENSITIVITY of the tachometer generator in VOLTS/KRPM.

The CURRENT MONITOR waveform may be observed at pin 4. There is a direct relationship between this waveform and the actual motor current. A DC voltmeter placed between pin 4 and common (calibrated in either current or torque) can serve as a means by which the constant load levels placed on the motor may be monitored. The current scale factor at pin 4 may be determined by the following chart:

VOLTAGE AT PIN 4	SBD4 CONTINUOUS CURRENT RATING
4.0 V	30 AMPS
4.0 V	45 AMPS
4.0 V	60 AMPS

NOTE:

The scaling of the Current Monitor is determined by both the compensation card and the SBD4 Motor Control Board. The lowest scaling of either will determine the scaling of the I. Mon.

NOTE:

Direction Limits are optional. This feature is not standard on all amplifiers. Refer to Model Number Scheme for option information.

The DIRECTION LIMITS at pins 6 and 7 must be held LOW during normal operation. These inputs are intended to be incorporated into the overall machine protection scheme, such as over-travel limit switches, etc. When either of these inputs transition HIGH continued motion will be prevented, while allowing movement in the opposite direction.

The EXTERNAL LIMIT input at pin 10 is taken LOW when external control for the reduction of motor torque is desired. When this input is taken HIGH full motor torque is restored **(CHECK TL FOR SET POINT AND VALUE OF EXTERNAL LIMIT)**.

The ENABLE input at pin 11 when held LOW will put the SBD amplifier into its enable mode. When this input is taken HIGH, the amplifier will become inhibited.

The TORQUE HOLD input at pin 12 when pulled LOW converts the SBD amplifier from a constant velocity (speed proportional to a command input signal) to a constant torque (torque proportional to a command input signal) system. The Torque Hold mode of operation may be utilized when the motor is required to dwell against hard stops or operate in a tension control system.

The velocity input signal is applied to the DIFF HI with respect to the DIFF LO inputs at pins 14 and 15.

Terminations to the OUTPUT connector:

The NO FAULT output at pins 1 and 3 of C-93 when LOW (internal contact closed) is an indication to the "outside world" that no faults are indicated within the SBD amplifier and that the DRIVE-UP mode may be initiated. After the drive is enabled, the relay may open due to the drive being in current limit and may give an indication of following error at the CNC.

The DRIVE-UP output at pins 4 and 5 of C-93 when LOW (internal contact closed) is an indication to the "outside world" that the SBD amplifier is presently in its ENABLE mode or when the internal contact is open, is an indication that the amplifier is in its INHIBIT mode.

5.0 PRELIMINARY CHECKS AND START-UP

Refer to Drawings C-81336, C-81332, and C-81373.

Once the SBD system has been installed and wired in, continue with the Preliminary Check-Out procedure to ensure proper operation.

The following equipment will be required:

1. Adjustment signal source 0 to ± 9 V DC @ 10 ma. (Optional)

2. D.C. Voltmeter

5.1 Power Transformer Hook-Up

Before applying the main power, do the following:

1. Open the power circuit of the isolation transformer secondary by removing the fuses or disconnecting the wiring from the diode bridge of the main bus power supply.

2. Apply power. Per the power isolation transformer documentation, monitor the line-to-line voltage of the transformer secondary to ensure that it is correct and that the transformer has been wired correctly. Remove power.

3. Reconnect the transformer secondary to the diode bridge of the main bus power supply. Disconnect the B + and B - connections at the power supply terminal blocks or SBD amplifiers. Apply power. Monitor the main bus voltage (application dependent) to ensure that it is correct. Remove power. Allow approximately two (2) minutes for the power stage capacitors to discharge. Reconnect the main bus leads of the SBD units(s).

NOTE:

In the case of SBD multi-axis systems, it is recommended that the system be checked out one axis at a time. Axes sections not being checked should be disconnected and removed from the frame assembly.

5.2 Preliminary Start-Up

Begin the preliminary start-up of the axis sections with the motor load(s) disconnected. Use the adjustable DC signal source (Optional) to provide an input signal.

Apply power and enable the SBD unit; be ready to switch off the main power if runaway occurs. If the motor sets still and the results to this point are satisfactory, proceed. If not, recheck the motor tach phasing per Section 4.3.

Starting with a small signal, apply a command to the input of the amplifier. Run the motor first in one direction then the other. Have an assistant help observe the operation of the motor. The motor should accelerate and decelerate with quick crisp response and run with constant speed for any given input signal level.

CAUTION:

DO NOT RUN THE MOTOR IN EXCESS OF THE MAXIMUM SPEED SPECIFIED BY THE TL SHEET FOR THE SYSTEM (REFER TO PAGE 1)

5.3 Connecting the N/C or C/N/C

Remove the power. Disconnect the manual signal source (if used) and connect the numerical controller.

CAUTION:

Incorrect Servo to Position Loop phasing can cause large excursion oscillations or runaways.

Appropriate precautions should be taken to stop the machine if necessary. Slides, etc. should be moved a reasonable distance away from hard stops before applying power.

Apply power and observe the action of the machine. If it is determined that the direction of rotation of the INDUSTRIAL DRIVES motor is reversed or runs in the wrong direction, remove power and reverse both the tach leads and the motor armature leads.

6.0 ADJUSTMENTS

Refer to Figures 4, 5, 6, 7, and Drawing C-81251-1

The adjustments are classified into three categories:

1. Set-Up Adjustments -- The adjustments which are necessary at the time of installation.

   a. SPEED SCALE FACTOR: Pot 43 Located on the SBD4-COMP Card

   b. ZERO: Pot 46 Located on the SBD4-COMP Card

2. Response and Application Dependent Adjustments -- The adjustments which add versatility to the SBD4 system and which allow it to be "tailored" to the machinery.

   If the SBD4 system is to be utilized as shipped per the enclosed TL Sheet and if the inertial load is no more than twice the motors self-inertia, then these adjustments probably will not need any attention.

   a. AC GAIN: Pot 45 (Located on the SBD4-COMP2 Card

   b. DC GAIN: Pot 44 (Located on the SBD4-COMPTL Card

   c. COMPENSATION: Pot 44 (Located on the SBD4-COMP2 Card or on the SBD4-COMPTL Card)

   d. TACH LOSS: Pot 88 (Located on SBD4-COMPTL Card)

3. Design Tolerance Adjustments -- The adjustments which are Factory Set and Sealed.

CAUTION:

POT 105 (HALL EFFECT GAIN) CANNOT BE FIELD ADJUSTED.

IF THIS ADJUSTMENT IS DISTURBED, RETURN THE SBD4 UNIT TO THE FACTORY FOR CALIBRATION.

These pots should never require adjustment.

POSITIVE 12 VOLTS	POT 10 - Located on the SBD1-PS1 Card
NEGATIVE 12 VOLTS	POT 28 - Located on the SBD1-PS1 Card
REGEN LEVEL	POT 19 - Located on the ACS-REG2 Card
OVERVOLTS	POT 20 - Located on the ACS-REG2 Card
CURRENT OFFSET	POT 157 - Located on the SBD4-MC2 Card
HALL EFFECT OFFSET	POT 107 - Located on the SBD4-BD2 Card
HALL EFFECT GAIN	POT 105 - Located on the SBD4-BD2 Card

6.1 Set-Up Adjustments (Located on the SBD4-COMP2 or SBD4-COMPTL Cards)

Refer to Figure 6 or Figure 7.

These adjustments will need to be made when the SBD4 is first turned on.

6.1.1 Zero Adjustment (Within Position Loop)

If the "Following Error" is displayed by way of monitor readout, simply adjust the Zero Pot (located on the SBD4-COMP Card) for zero "Following Error" at zero speed.

NOTE:

The Zero Pot is Pot 46 on the COMP2 Card or Pot 88 on the COMPTL Card.

OPTIONAL: Monitor DIFF HI with respect to DIFF LO of the SBD4 (at the back of the I/0 connector) with a DC voltmeter. Command zero speed from the Numerical Controller. Adjust the Zero Pot for zero volts on the meter.

6.1.2 Zero Adjustment (Manually Operated Machines)

Monitor the input at Diff. HI with respect to Diff. LO at the rear of connector I/0-14 and 15 (refer to System Wiring Diagrams C-81332 or C-80971) with a D.C. voltmeter. With the input signal at zero volts adjust Pot 46 for zero volts at TACH HI with respect to TACH LO on the I/0 connector.

6.1.3 Speed Scale Factor (Within Position Loop)

NOTE:

The Speed Scale Pot is Pot 43 on the COMP2 Card or Pot 85 on the COMPTL Card.

If the "Following Error" is displayed by way of Monitor Readout, simply command a low feed rate and adjust Speed Scale Pot for the proper "Following Error."

OPTIONAL: Monitor DIFF HI with respect to DIFF LO of the SBD4 (at the back of the I/0 connector) with a DC voltmeter. Command 25% of maximum traverse speed. Adjust Speed Scale Pot for 25% of the specified maximum output from the Numerical Controller.

NOTE:

The Command voltage should never exceed ± 9 Volts.

6.1.4 Speed Scale Factor (Manually Operated Machines)

Turn Speed Pot fully CCW. Monitor DIFF HI with respect to DIFF LO of the SBD4 (at the back of the I/0 connector) with a DC voltmeter. Apply 25% of maximum command input signal. Turn Speed Pot CW for 25% of maximum speed.

NOTE:

The SBD4 is normally shipped with the "Speed" pot set for max input = 1/2 speed.

6.2 Response Adjustments (Located on the SBD4-COMP2 Card)

Refer to Figure 6 or 7

NOTE:

The Compensation Pot is Pot 44 on the COMP2 Card and Pot 88 on the COMPTL Card. The AC Gain Pot is Pot 45 on the COMP2 Card only.

When it becomes necessary to alter the response of the SBD4 system, it is assumed that the response desired is based on the following criterion:

1. A step input be applied
2. Fastest tach rise time
3. No more than 5% overshoot
4. No more than 2 cycles of ringing

To achieve a response having similar characteristics to those above or a response which may be defined as being somewhat critically damped, do the following:

1. Turn the Compensation Pot fully CW.

2. Turn the AC Gain Pot fully CCW (SBD4-COMP2 Card only).

3. With an oscilloscope or chart recorder, monitor the TACH FEEDBACK signal at TP6-7 (located on the SBD4-MC2 Card) with respect to TP4.

4. Apply a step input. Accelerate and decelerate the motor at approximately 25% of the maximum application speed.

5. Adjust the AC Gain Pot for the maximum tach rise time conducive to a stable system, with no more than 20% overshoot and with not more than 3 cycles of ringing.

6. If at this time, the test instrument reveals a response with an objectionable amount of overshoot, and it is desired to move further toward an overdamped response (with a greater sacrifice of tach rise time) turn the Compensation Pot CCW to roll off the overshoot.

6.3 Design Tolerance Adjustments

These adjustments are not intended to be adjusted in the field. They have been factory set and sealed and should never requirement adjustment.

6.3.1 ± 12 Volt Adjustments (Located on the SBD1-PS1 Card)

With a DC voltmeter, monitor the + 12 volt test point TP13A with respect to TP13B.

Adjust Pot 10 for + 12 volts ± 100 mv.

Monitor the - 12 volt test point TP13C. Adjust Pot 28 for - 12 volts ± 100 mv.

6.3.2 Regen Level (Located on the ACS-REG2 Card)

Monitor TP27 with a DVM. Adjust Pot 19 for + 8 volts.

6.3.3 Overvolts (Located on the ACS-REG2 Card)

Monitor TP4 with a DVM. Adjust Pot 20 for 6.25 volts.

6.3.4 Current Offset (Located on the SBD4-MC2 Card)

Remove power. Place a jumper from TP6-4 to TP6-6. Monitor TP6-5 with respect to TP4 with a DVM. Apply power and enable the SBD4. Adjust Pot 157 for zero volts on the meter. Remove power. Remove the jumper.

6.3.5 Hall Effect Offset (Located on the SBD4-MC2 Card)

Remove power. Place a jumper from TP6-4 to TP6-6. Monitor I MONITOR output at I/0 connector pin 4 with respect to TP4 with a DVM. Apply power and enable the SBD4 unit. Adjust Pot 107 for zero volts on the meter. Remove power. Remove the jumper.

6.3.6 Hall Effect Gain (Located on the SBD4-MC2 Card)

CAUTION:

THE HALL EFFECT GAIN POT 105 CANNOT BE FIELD ADJUSTED. IF THIS ADJUSTMENT IS DISTURBED, RETURN THE SBD4 UNIT TO THE FACTORY FOR CALIBRATION.

6.3.7 Tach Loss Adjustments (Located on the SBD-4 COMPTL Card only)

Place jumper 34 between pins as specified on the TL. With a digital meter, monitor TP 12 on the COMPTL Card. Switch DC input from + to - while monitoring the voltage on the meter. Adjust Pot 90 until the voltage is balanced between the two directions within ± 20 mv.

Refer to the TL, if the system has tach loss, proceed with the following adjustment. Remove jumper 34. Apply an input to achieve tach loss speed per TL. Adjust Pot 89 until LED 27 fault light turns on. Replace jumper 34 between pins as specified on the TL and reset SBD4. Accelerate and Decelerate the motor at rated speed. If tach loss occurs, turn POT 89 1/2 turn. Acc & Dec the motor again to make sure no nuisance trips occur.

7.0 CONNECTOR KITS

Mating connectors are customer furnished items which may be obtained either from INDUSTRIAL DRIVES or purchased directly from connector vendors. One connector kit is required for each SBD4 amplifier.

1. Connector kit when the Single Board Drive (SBD4) is used "Stand Alone" (Refer to Figure 2, Drawings C-81336 and C-81332) or when used in a Single Board Frame Assembly with Power Supply (SBFP). Refer to Figure 1, Drawings C-80717, C-81119 and C-81373).

CONNECTOR KIT PART NUMBER	CONNECTORS IN KIT	DESCRIPTION
SBC4-000	I/0, OUTPUT, LS (Logic Supply)	Standard Crimp Type Pins with No Leads Attached

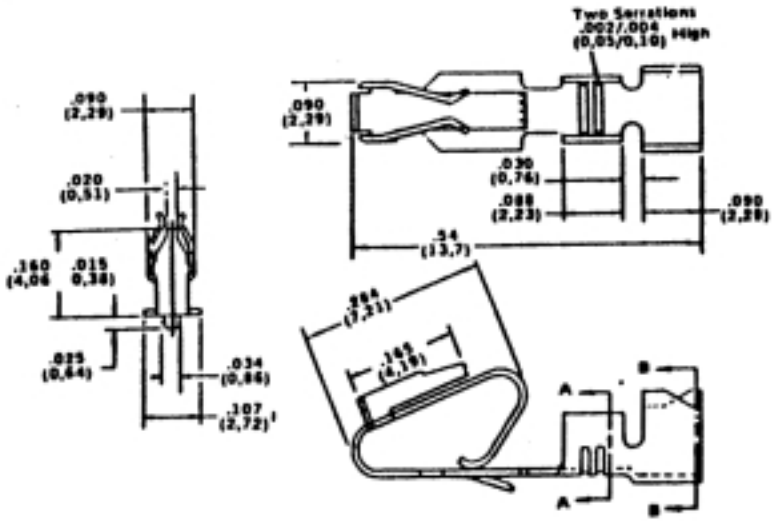
2. Single Board Regeneration (SBR1) Module connector kit when used "Stand Alone" (Refer to Figure 8, Drawings C-80635 and C-80636)

CONNECTOR KIT PART NUMBER	CONNECTORS IN KIT	DESCRIPTION
B-80746-001	C15	WITH 1 METER LEADS ATTACHED
B-80746-002	C15	WITH 2 METER LEADS ATTACHED
B-80746-003	C15	WITH 3 METER LEADS ATTACHED

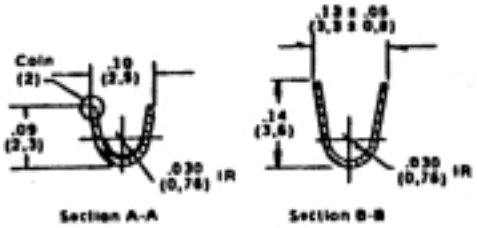
NOTE:

Single Board Regeneration (SBR1) Module requires the large DC Bus connection only. No connector kit required when the Regeneration Board is mounted within a frame assembly.

DWG. NO	ISSUE
A-81585	1

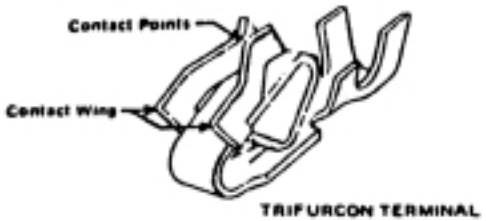


Crimp Dimensions



NOTES:

1. WIRE SIZE AWG 18-24.
2. INSULATION O.D. .110", (2.79 MM) MAX.
3. FOR USE WITH A-81584 HOUSING.
4. TIN PLATED
5. DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS.



TRIFURCON TERMINAL

APPROVED VENDOR: MOLEX PART NO. 08-50-0189 LOOSE
08-50-0187 CHAIN

KC CONNECTORS — INDUSTRIAL DRIVES DIVISION — RADFORD, VIRGINIA

UNLESS OTHERWISE SPECIFIED	NO.	ECN NO.	DATE	APP'D.	NO.	ECN NO.	DATE	APP'D.	DW'N BY	DATE	PURCHASE SPEC. FOR CRIMP TERM. HOUSING FOR TRIFURCON TERM. (.156 CENTERS)	
XX DEC. PLACES ±.015									Tim G	8-26-85		
XXX DEC. PLACES ±.005									CH'K BY			
ANG. DIM. ±1°												
DO NOT SCALE DWG. USE DIMENSIONS ONLY									APP'D BY		SCALE:	DWG. NO. A-81585 / ISSUE 1
ALL DIMENSIONS ARE INCHES									SC M	9-19-85		
UNLESS OTHERWISE SPECIFIED												

DWG. NO	ISSUE
A- 82779	1

NOTE: SEE DWG. NO. A-81584 FOR CRIMP TERMINAL HOUSING.

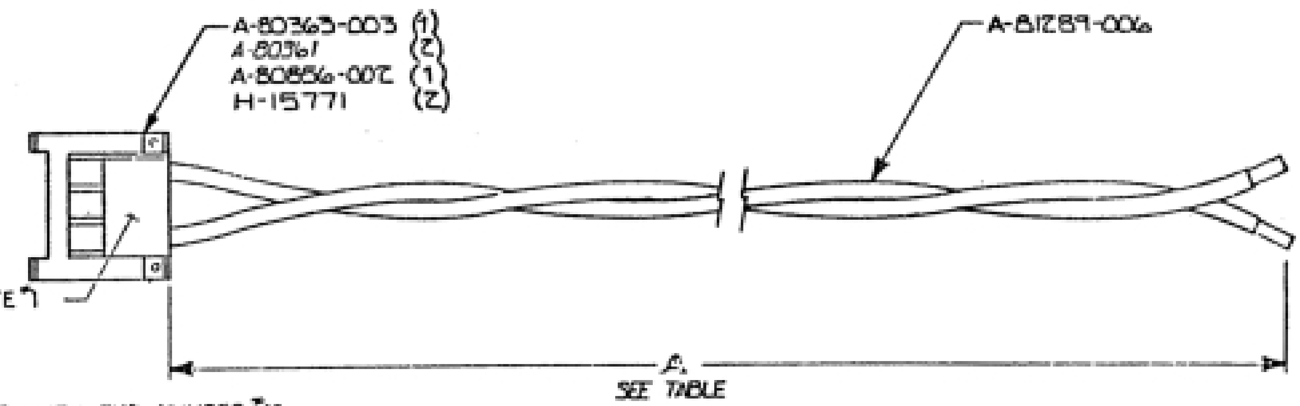
APPROVED VENDOR: MOLEX (89-00-3001)

ROLLMOUGEN CORPORATION
INDUSTRIAL DRIVES DIVISION
RADFORD, VIRGINIA

UNLESS OTHERWISE SPECIFIED XX DEC. PLACES ± .01 XXX DEC. PLACES ± .005 ANG. DIM ±1°	NO	ECN NO.	DATE	APP'D.	NO.	ECN NO.	DATE	APP'D.	DW'N BY	DATE
DO NOT SCALE DWG. USE DIMENSIONS ONLY ALL DIMENSIONS ARE INCHES UNLESS OTHERWISE SPECIFIED									LLS	7-16-87
									CH'K BY	
									APP'D BY	7-17-87

PURCHASE SPEC.
POLARIZING KEY

SCALE:	DWG. NO.	ISSUE
	A- 82779	1



NOTES:
1)-MARK THIS SURFACE WITH THE NUMBER "15

DASH NO.	DIM A	DASH NO.	DIM A
001	3FT.	009	27FT
002	6FT.	010	30FT
003	9FT.	011	33FT
004	12FT.	012	36FT
005	15FT.		
006	18FT.		
007	21FT.		
008	24FT		

INDUSTRIAL DRIVES DIVISION
RADFORD, VIRGINIA

COLLECTOR KIT-BUS
SBCE

DWG SIZE B — DWG NO. 80746 — ISSUE 4

8.0 SPARE PARTS LIST

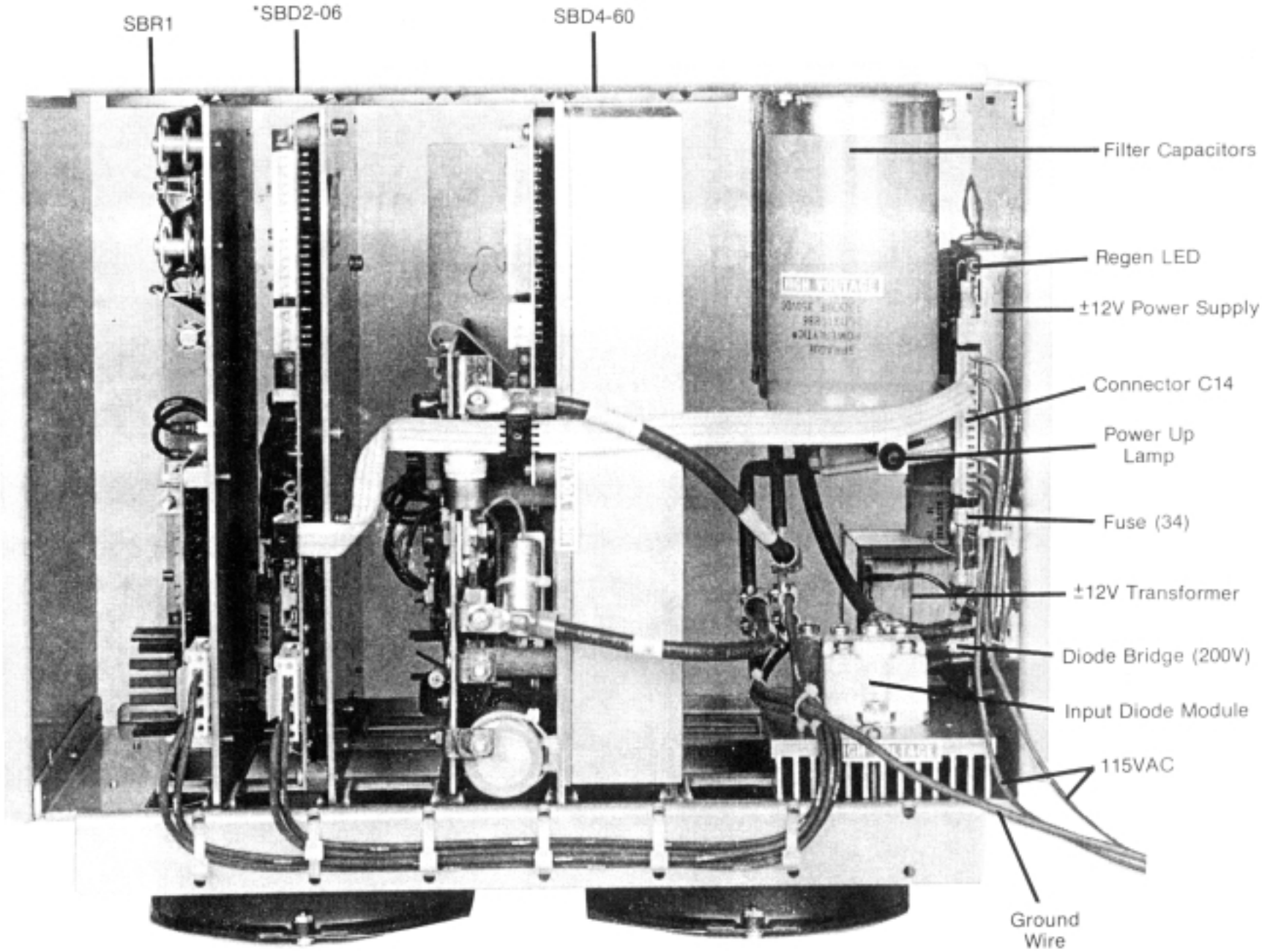
DESCRIPTION	SBD4-30	SBD4-45	SBD4-60
	PART NUMBER		
Power Transistor	A-82493	A-80504	A-80504
Fuse (F1)	A-80270-001 (35A)	A-80270-003 (50A)	A-80270-004 (60A)
Compensation Board			SBD4-COMP2 (Standard) SBD4-COMPTL (Optional)
SBD Hybrid			A-79952
Modulation Hybrid			A-79563
D.C. Bus Filter Capacitor			A-80741-004

DESCRIPTION	SBP1-15-13000	SBP1-15-23000
	PART NUMBER	
Large Filter Cap.	A-81580-001	A-81581-004
P.C. Board Assembly		SBD-PS2-01
Input Diode Module		A-81586
Fuse 26A, 26B (1A.)		A-78896-007
Fuse 3 (2A.)		A-78899-005

SPARE PARTS LIST (Con't)

DESCRIPTION	SBFPX/48,60-13000 SBP1-25,48-13000	SBFPX/48,60-23000 SBP1-25,48-23000
	PART NUMBER	
Large Filter Cap.	B-78636-009	B-78636-012
P.C. Board Assembly (For SBFPX Only)		C-80374
Input Diode Module		A-80532-002
Fuse (34) (2A.)		A-78899-008
Diode Bridge (200V)		A-80230-003
± 12 V. Transformer		A-80228

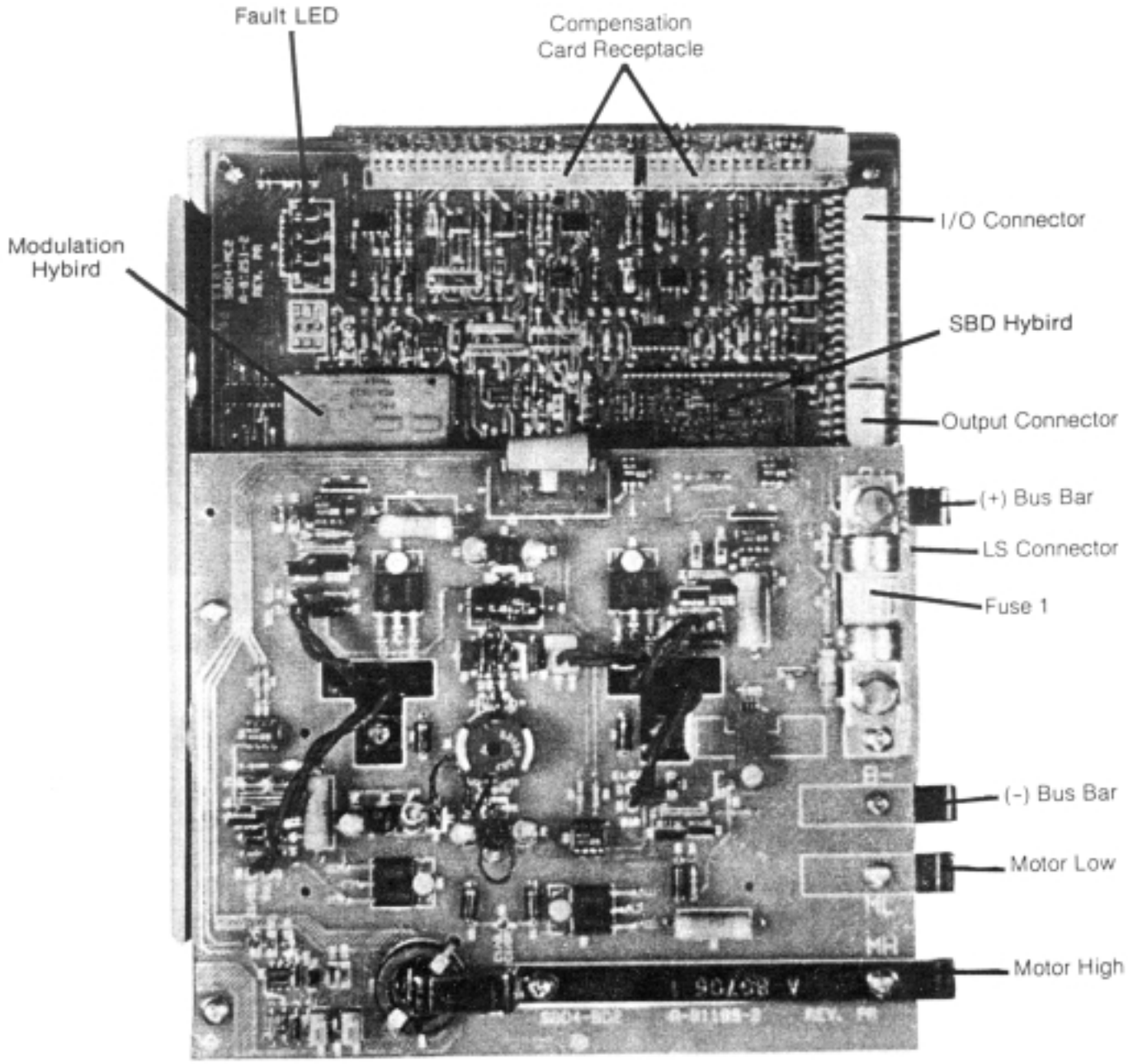
DESCRIPTION	SBR1-1000-160	SBR1-2000-225
	PART NUMBER	
P.C. Board Assembly	ACS-REG2-160	ACS-REG2-225
Power Transistor		A-80536
Diode Bridge (Flyback)		A-80130
Regen Fuse (12A.)		A-80552-002
Thermostat		A-80078
Regen Resistor (95W - 25 Ohm)		A-78892-002
Thermostat		A-80078
Regen Resistor (95W - 25 Ohm)		A-78892-002



SBFP3/62R-48-XXXXX

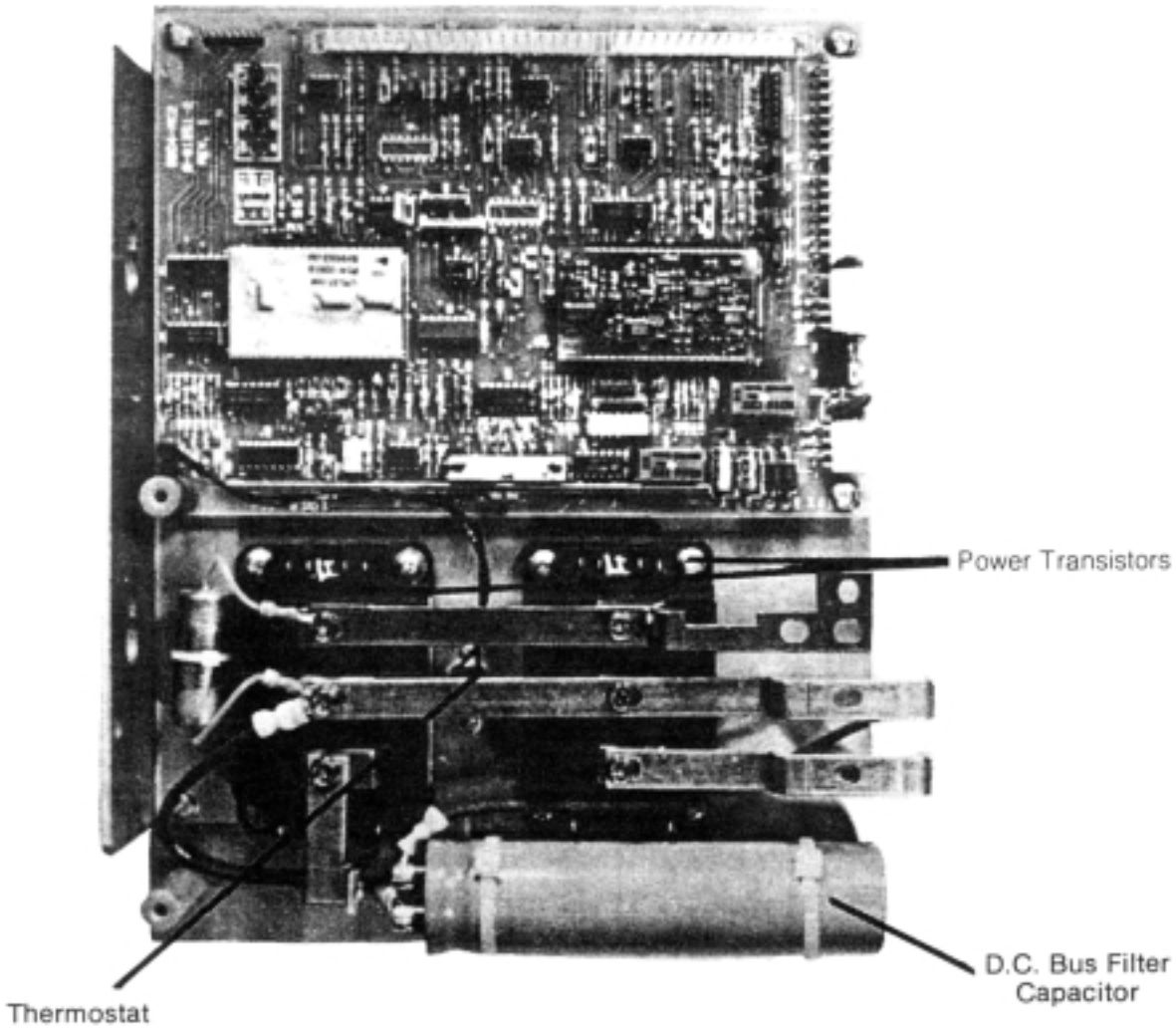
FIGURE 1

*Refer to Manual M-8404



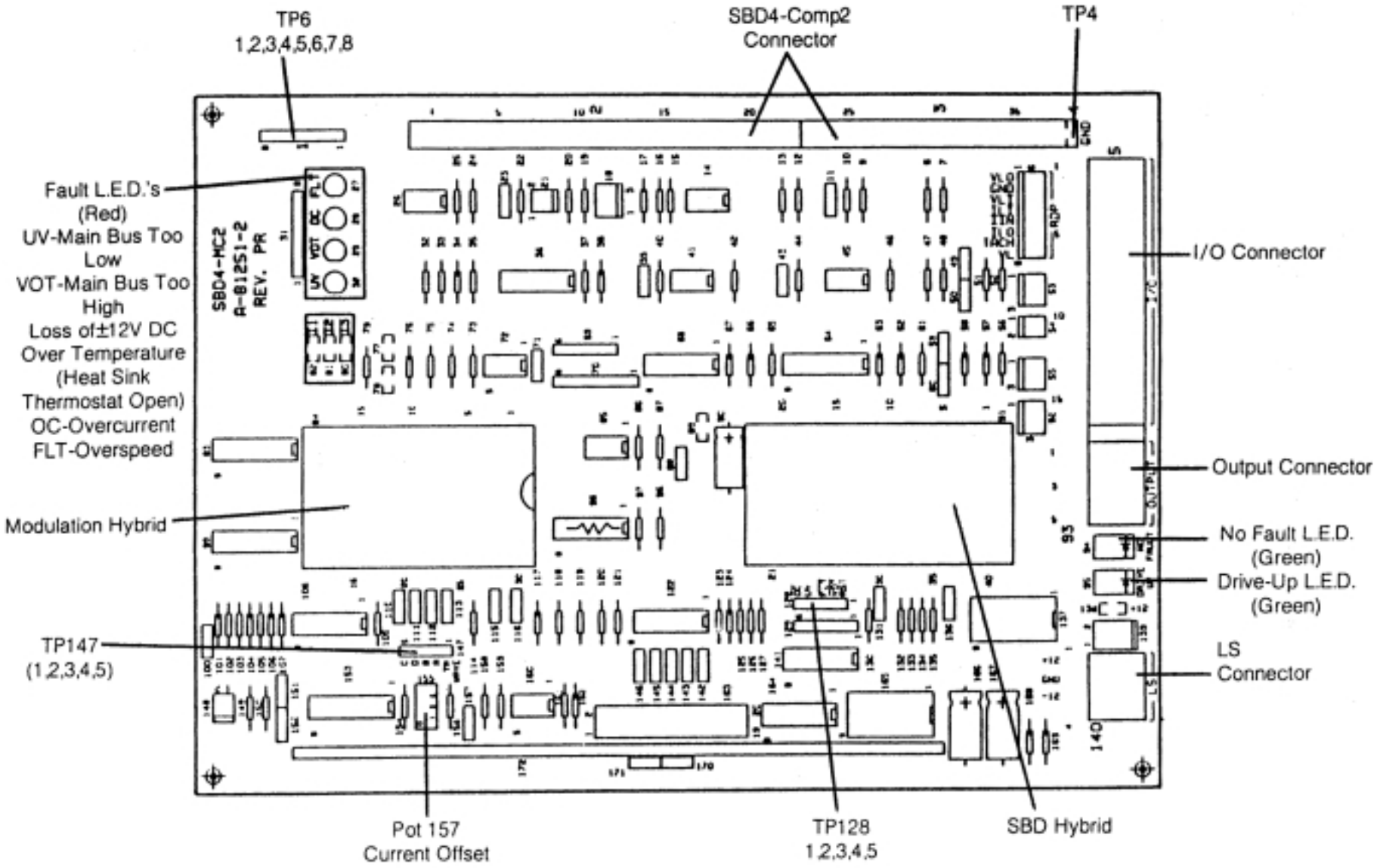
SBD4 AMPLIFIER

FIGURE 2



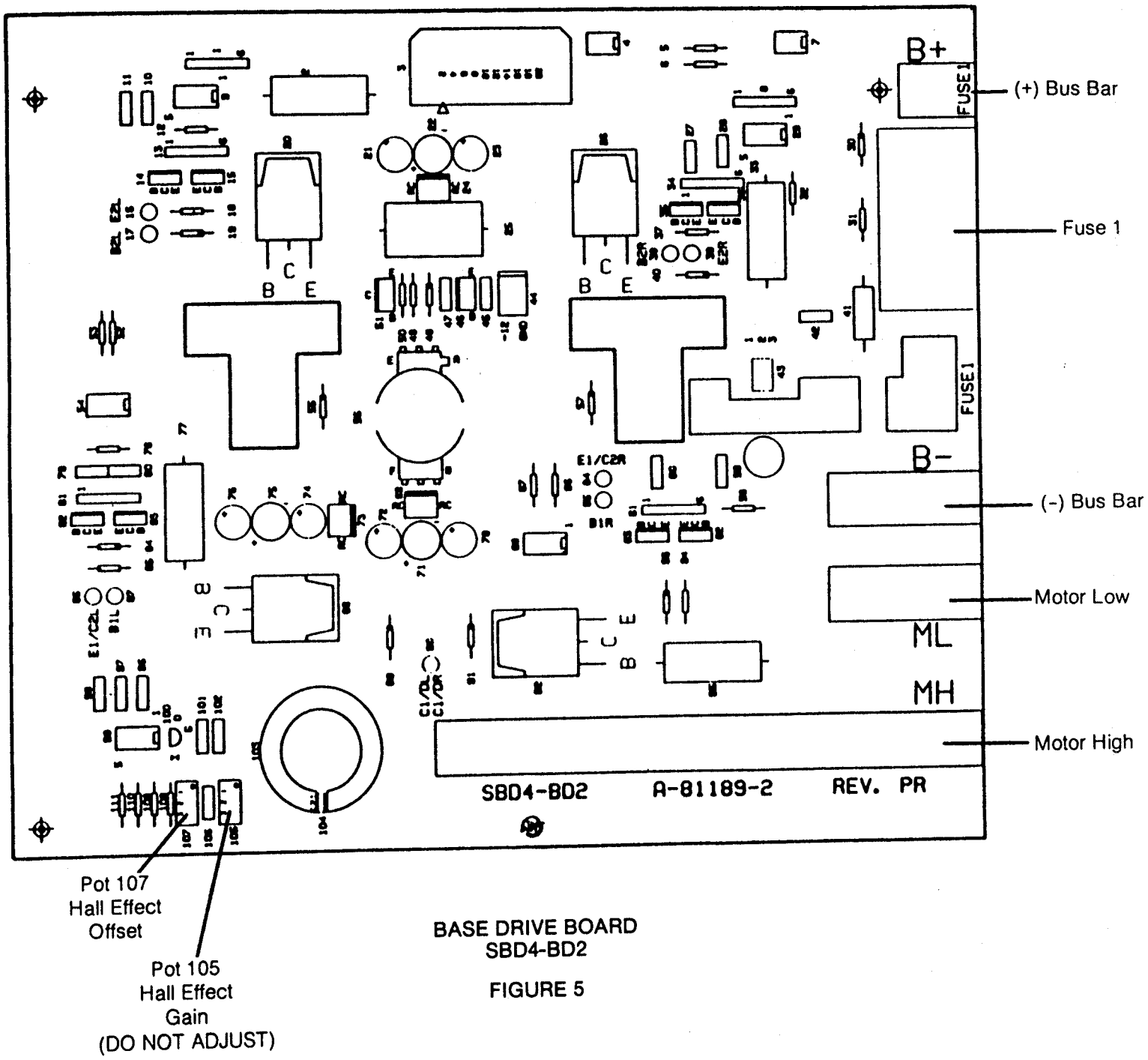
SBD4 AMPLIFIER
SHOWING POWER STAGE

FIGURE 3



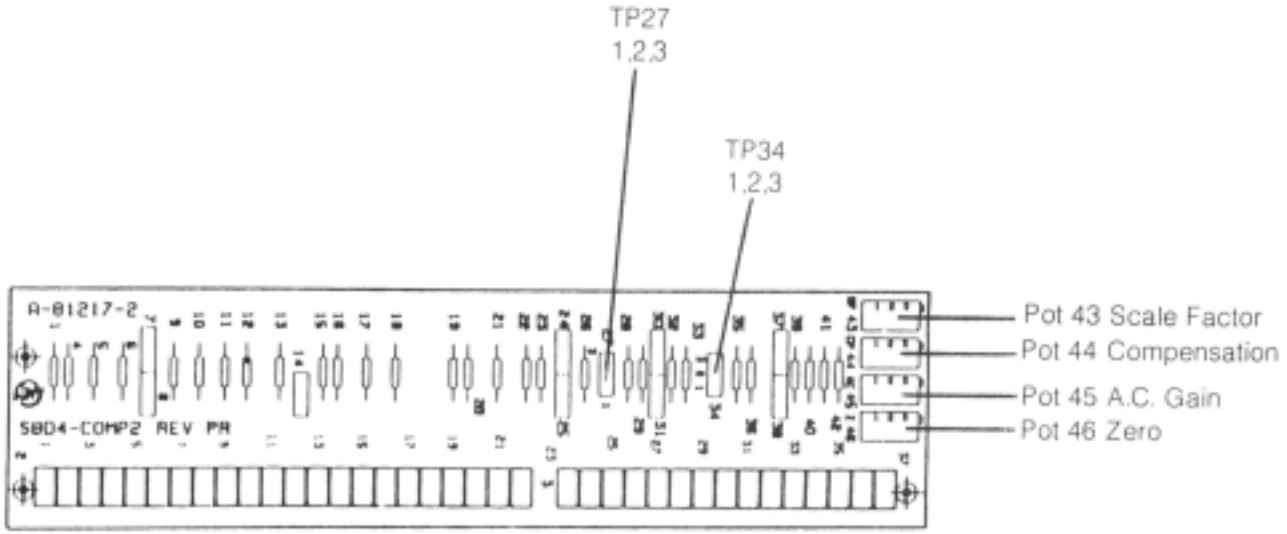
CONTROL BOARD
SBD4-MC2

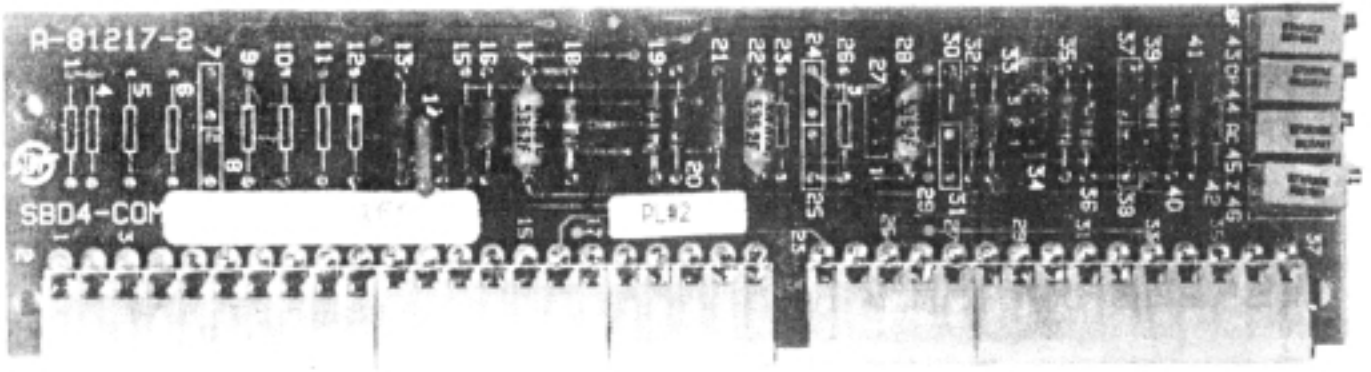
FIGURE 4



BASE DRIVE BOARD
SBD4-BD2

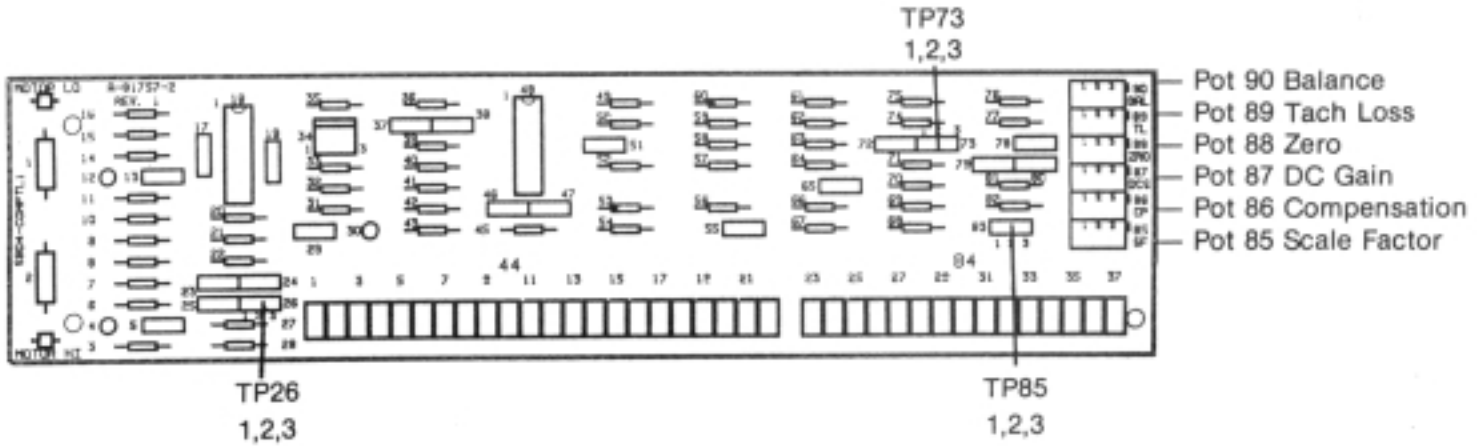
FIGURE 5

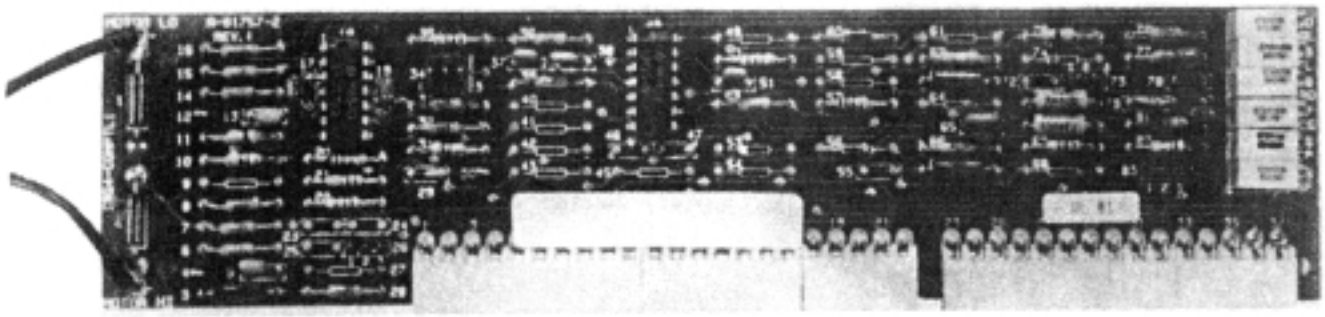




COMPENSATION BOARD
SBD4-COMP2

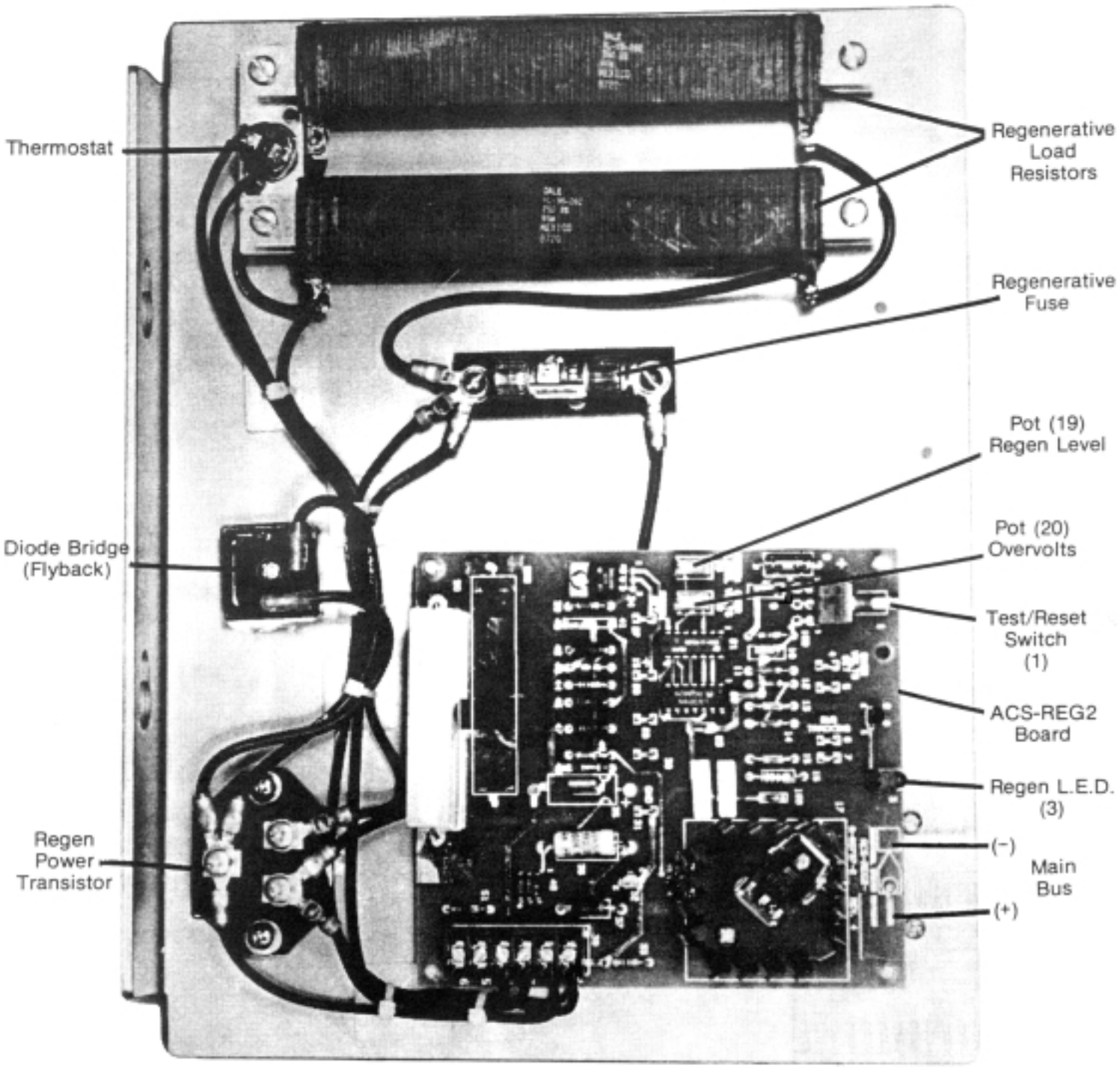
'GURE 6





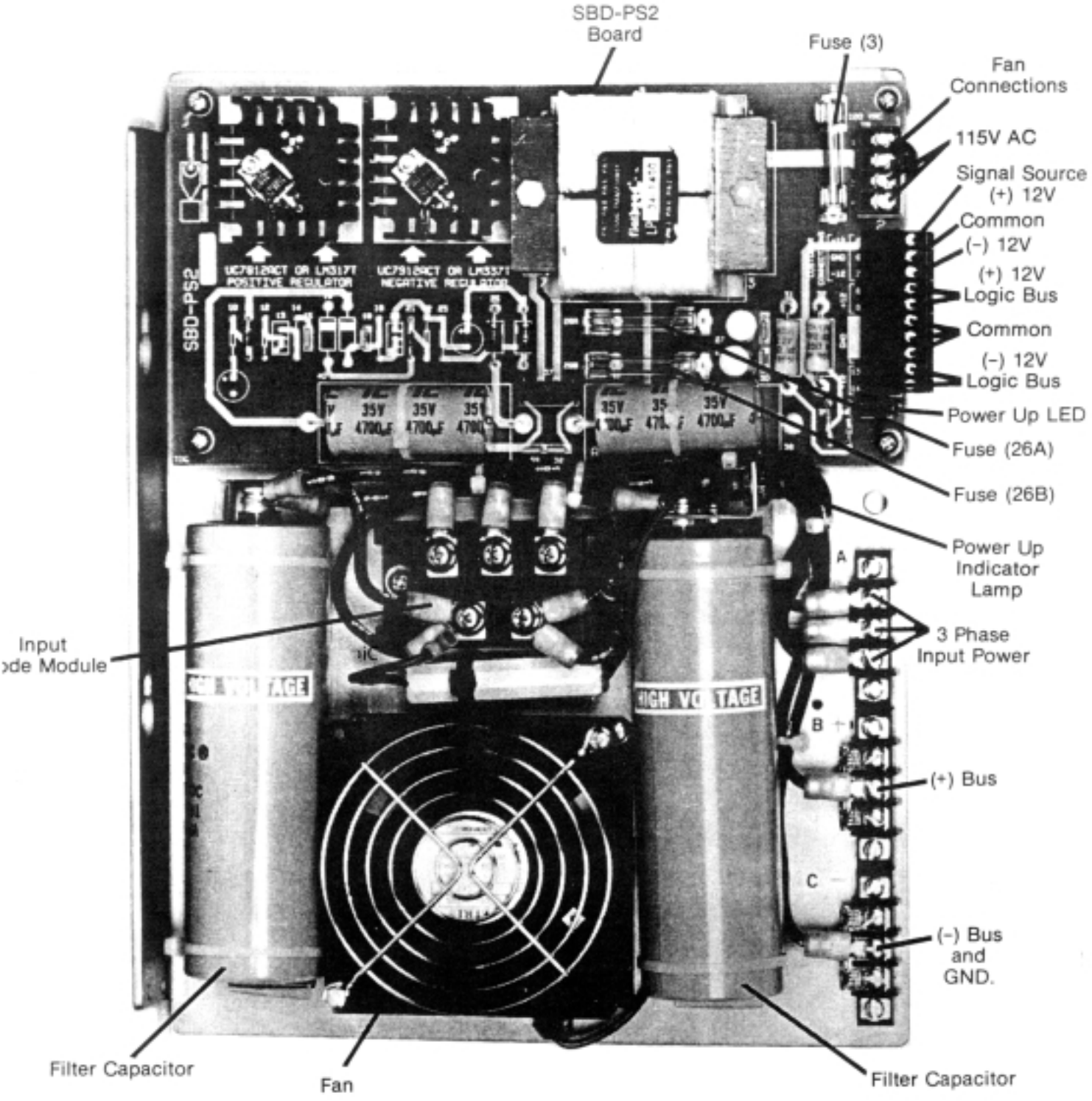
COMPENSATION BOARD
SBD4-COMPTL

FIGURE 7



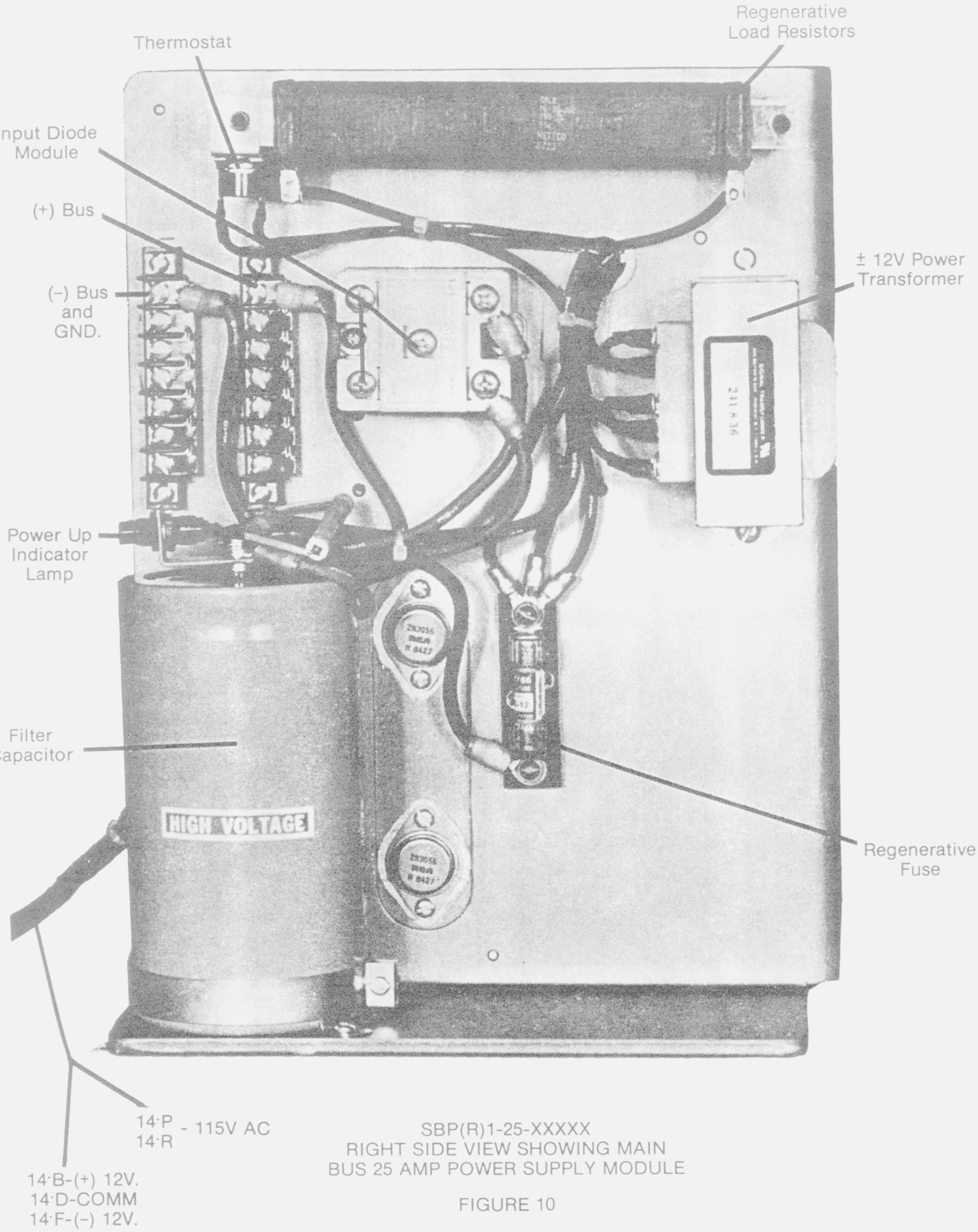
SBR1-XXXX-XXX
REGENERATION MODULE

FIGURE 8



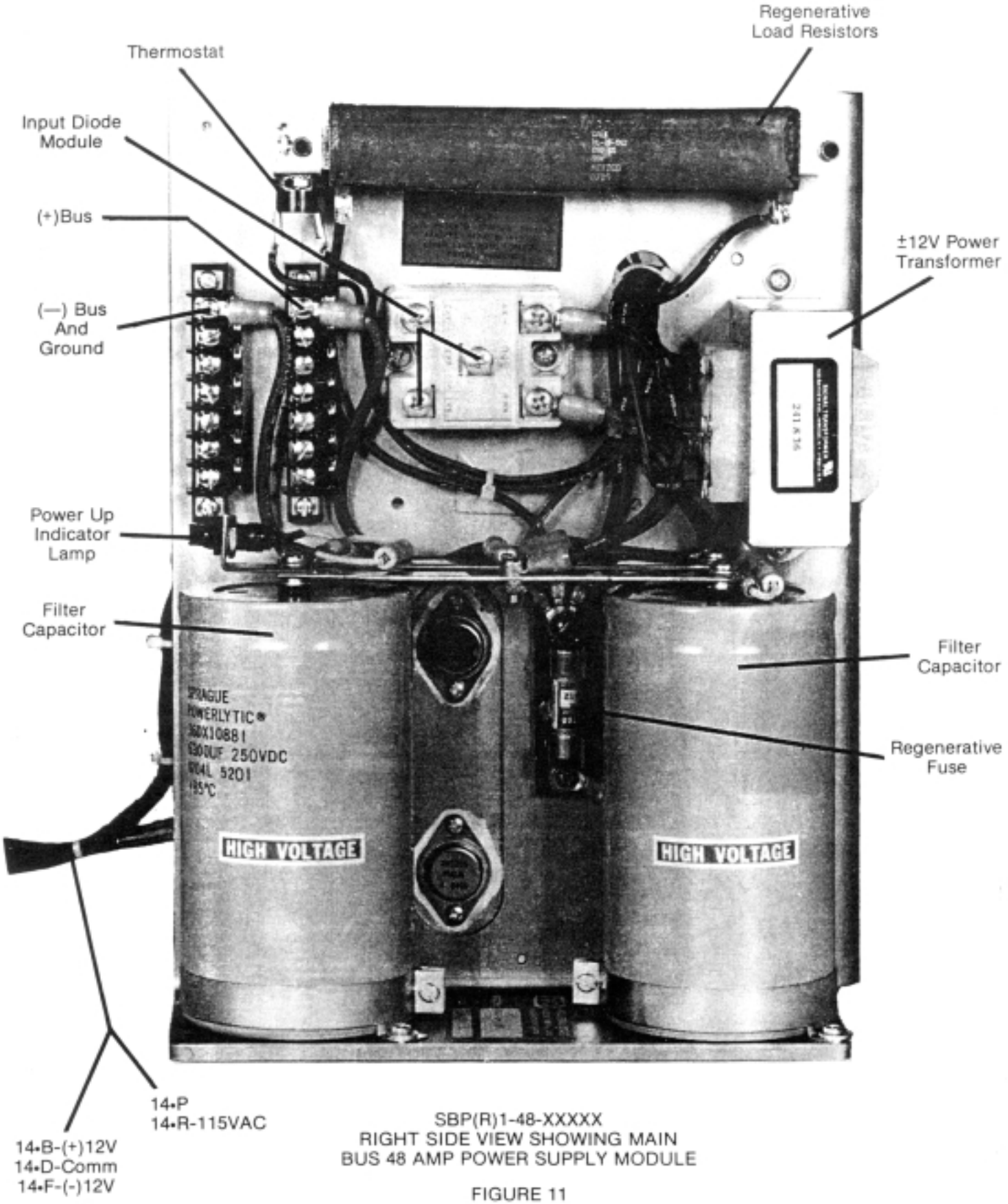
SBP(R)1-15-XXXXX
RIGHT SIDE VIEW SHOWING MAIN
BUS 15 AMP POWER SUPPLY MODULE

FIGURE 9



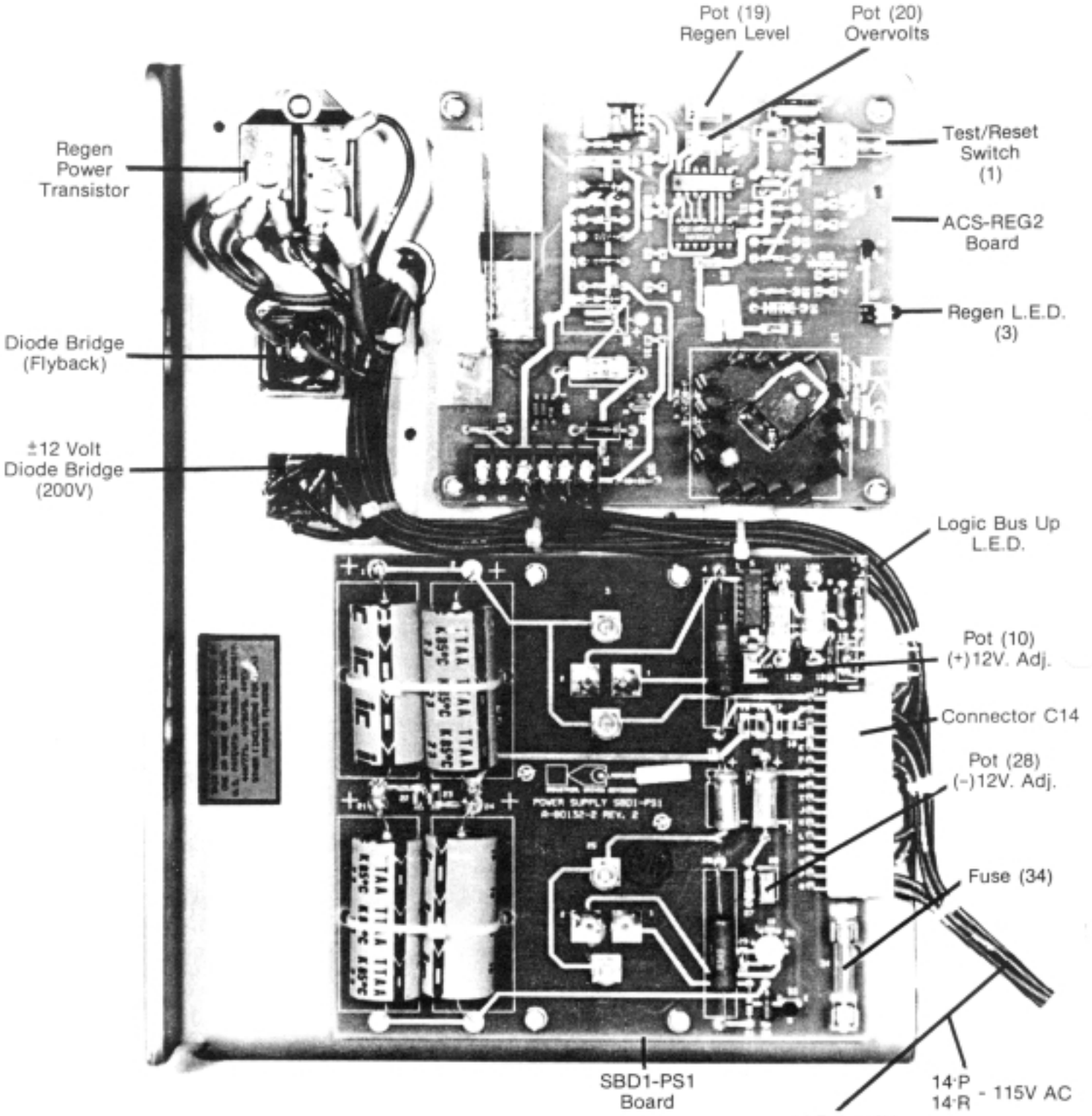
SBP(R)1-25-XXXXX
RIGHT SIDE VIEW SHOWING MAIN
BUS 25 AMP POWER SUPPLY MODULE

FIGURE 10



SBP(R)1-48-XXXXX
RIGHT SIDE VIEW SHOWING MAIN
BUS 48 AMP POWER SUPPLY MODULE

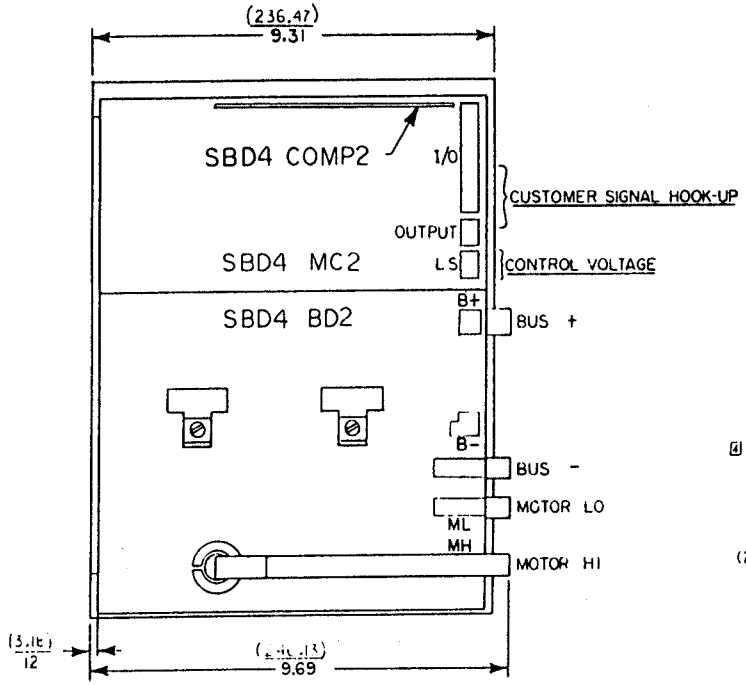
FIGURE 11

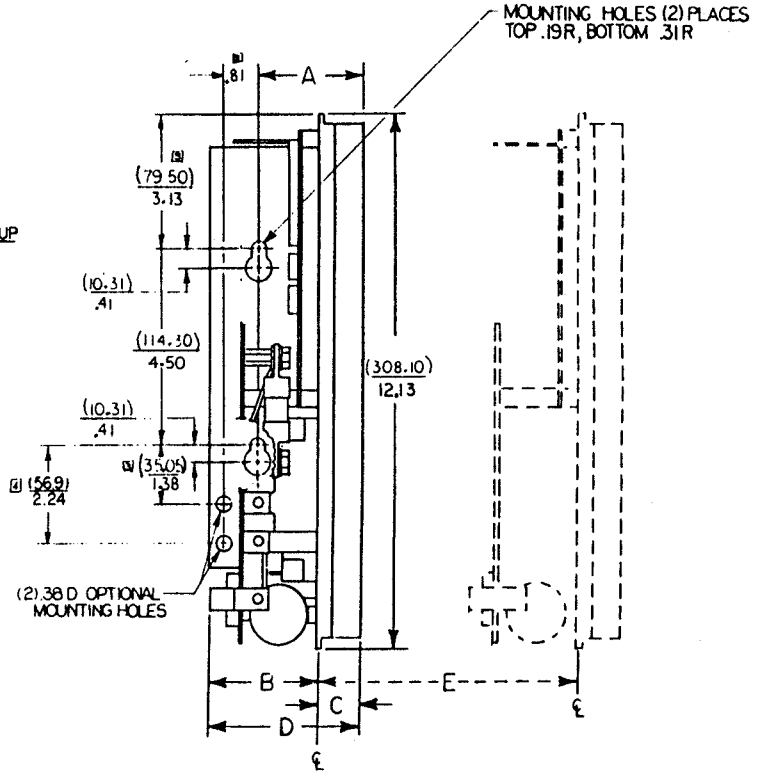


SBP(R)1-15,25,48-XXXXX
LEFT SIDE VIEW SHOWING
REGENERATION MODULE AND
± 12 VOLT CONTROL SUPPLY

FIGURE 12

DO NOT SCALE DWG. USE DIMENSIONS ONLY. ALL DIMENSIONS ARE INCHES UNLESS OTHERWISE SPECIFIED	UNLESS OTHERWISE SPECIFIED AS DEC. PLACES ± .010 MFR DEC. PLACES ± .005 AND ANG ± 1°	UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS AND BREAK ALL SHARP EDGES	DWG SIZE C	DWG. NO. 81336	ISSUE 4



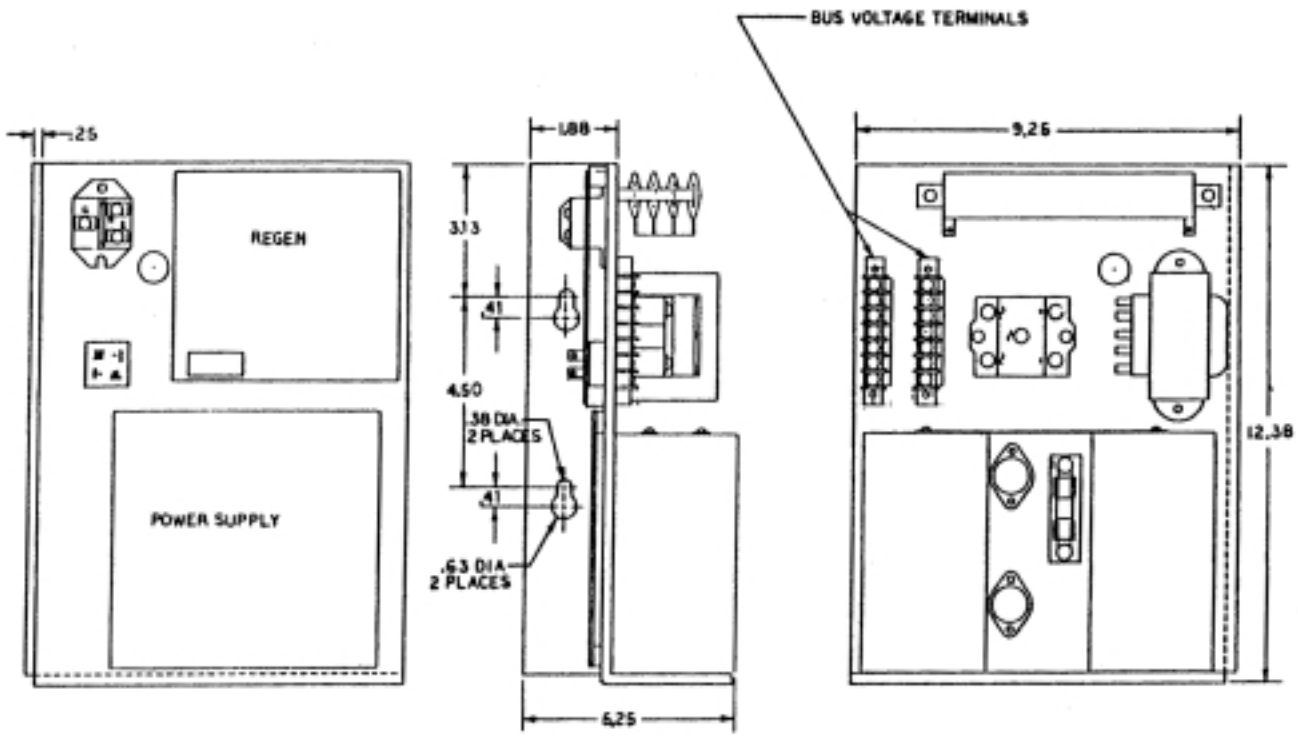


NOTES:
1) DIMENSION = (MM) / INCHES

MOUNTING DIMENSIONS (INCHES)					
AMP.	A	B	C	D	E
30	2.44	2.56	1.00	3.56	4.00
45	2.44	2.56	1.00	3.56	4.00
60	3.63	2.56	2.19	4.75	5.19
20	1.25	1.68	.125	1.81	2.00
06, 10, 16	1.25	1.75	.062	1.81	2.00

MOUNTING DIMENSIONS (MM)					
AMP	A	B	C	D	E
30	61.98	65.02	25.40	90.42	101.60
45	61.98	65.02	25.40	90.42	101.60
60	92.20	65.02	55.63	120.65	131.83
20	31.75	42.67	3.18	45.97	50.80
06, 10, 16	31.75	45.09	1.57	45.97	50.80

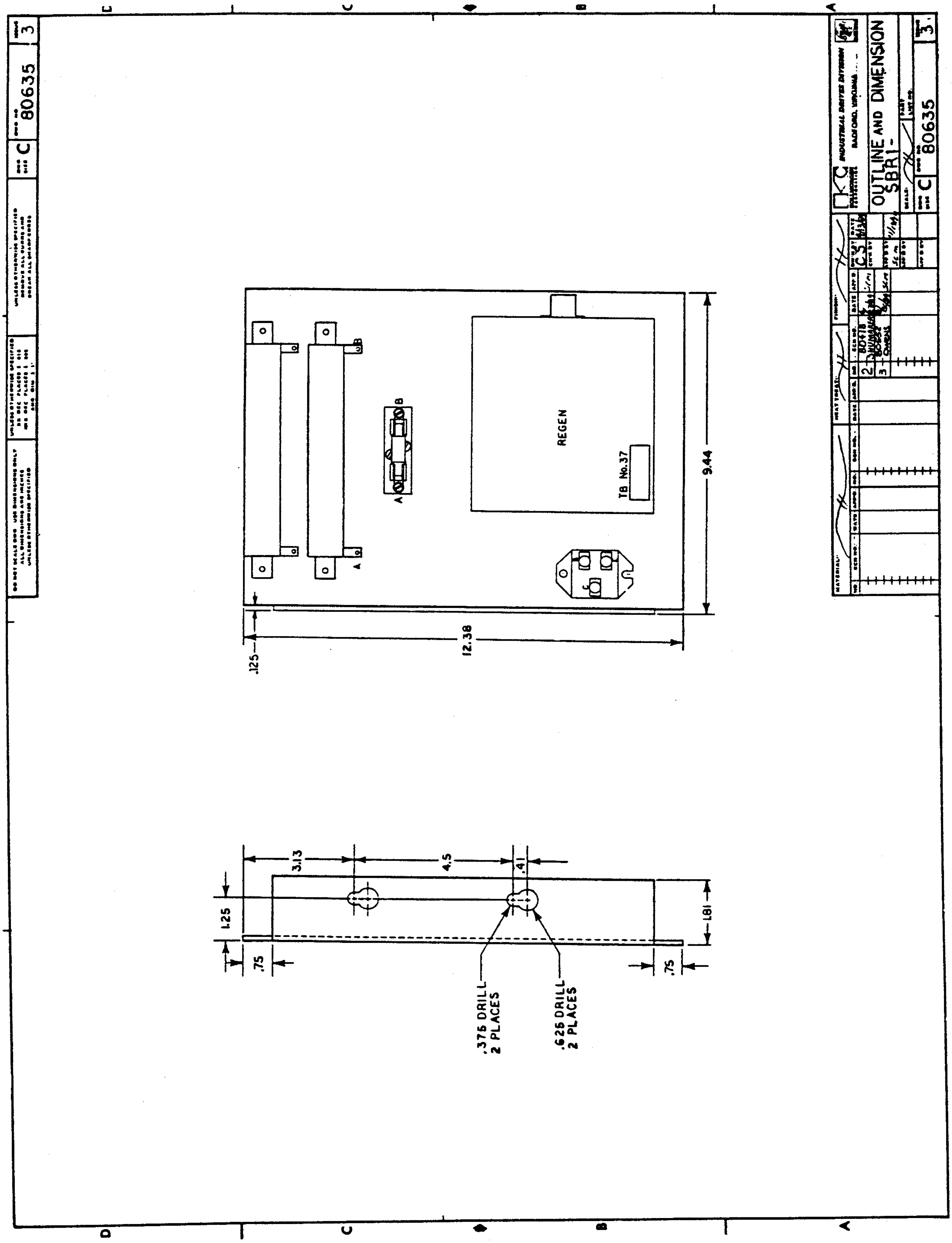
MATERIAL	HEAT TREAT	FINISH	INDUSTRIAL DRIVES Radford, Virginia
			OUTLINE & DIMENSION SBD4
			SCALE: PART LIST NO.
			DWG SIZE C DWG NO. 81336 ISSUE 4

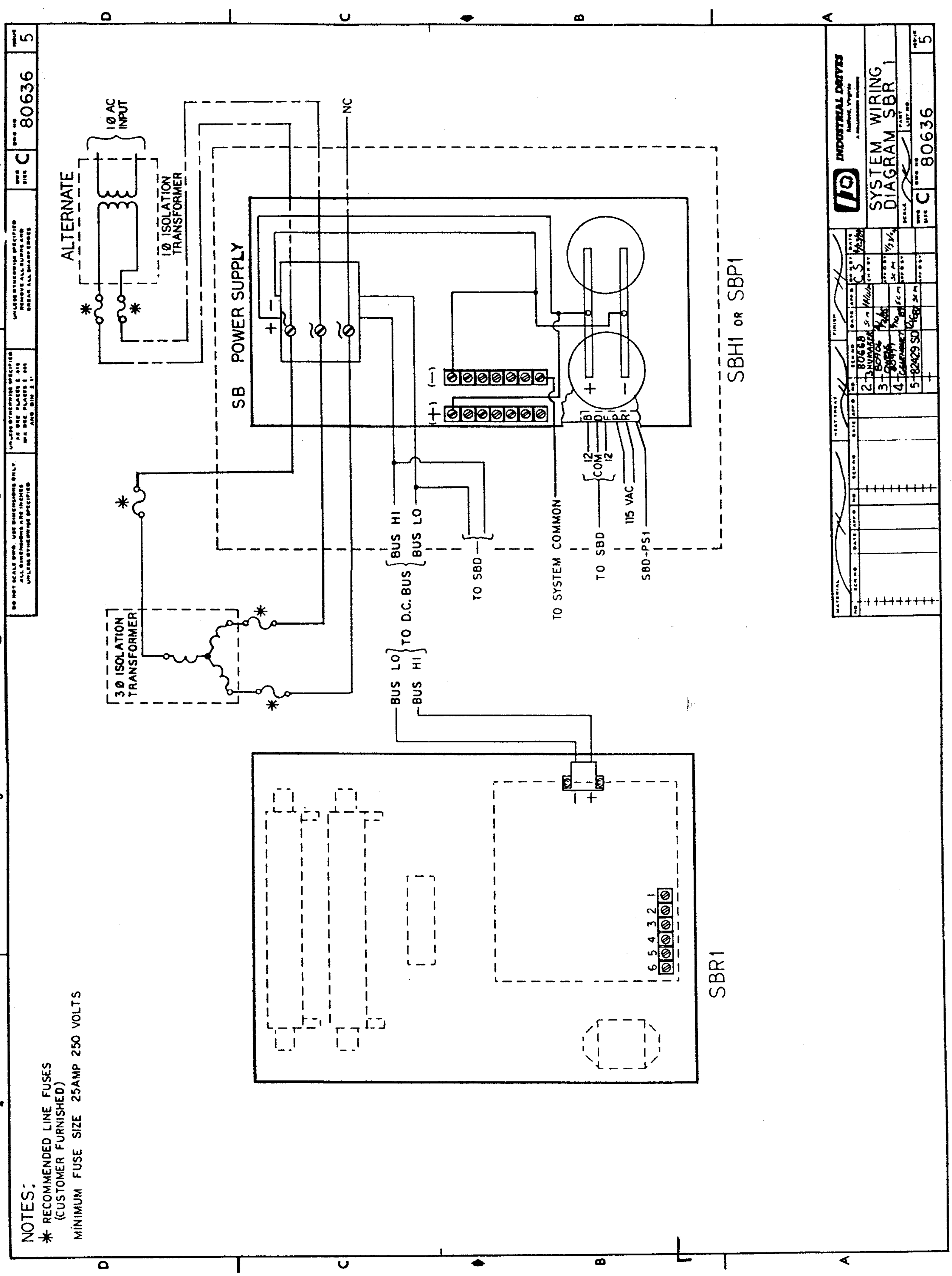


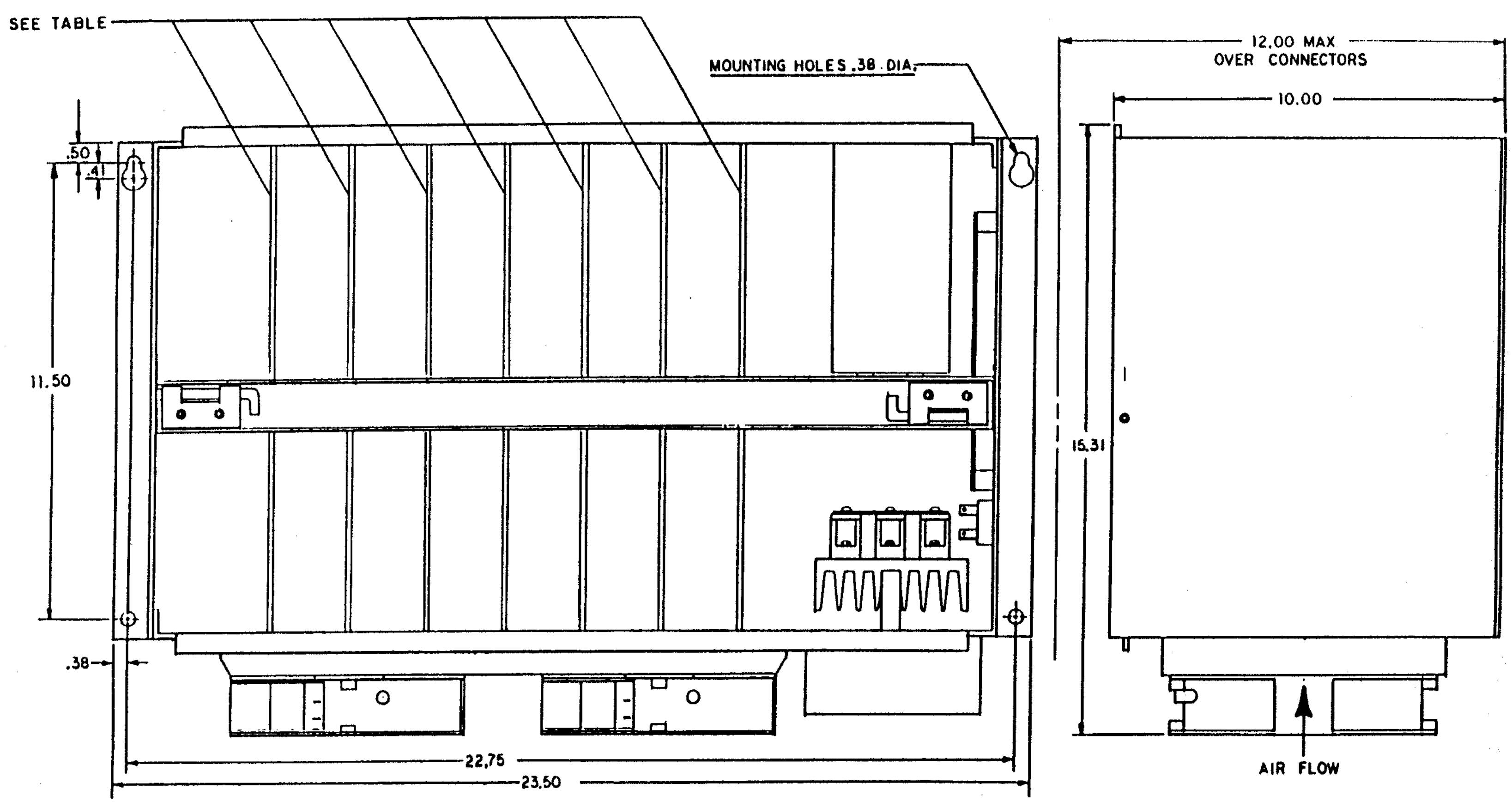
			C	80451	2

OUTLINE & DIMENSIONS
SBPR1-

			C	80451	2


OUTLINE AND DIMENSION
SBR1-
80635
C
3
KC INDUSTRIAL DRIVES DIVISION
RADFORD, VIRGINIA
REGEN
TB No.37
9.44
12.38
.125
3.13
4.5
.41
1.25
1.81
.75
.75
.375 DRILL
2 PLACES
.625 DRILL
2 PLACES
A
B


NOTES:
* RECOMMENDED LINE FUSES (CUSTOMER FURNISHED)
MINIMUM FUSE SIZE 25AMP 250 VOLTS
ALTERNATE
1Ø AC INPUT
1Ø ISOLATION TRANSFORMER
3Ø ISOLATION TRANSFORMER
NC
SB POWER SUPPLY
SBH1 OR SBP1
BUS HI
BUS LO
TO D.C. BUS
TO SBD
TO SYSTEM COMMON
12
COM
115 VAC
TO SBD
SBD-PS1
SBR1
INDUSTRIAL DRIVES
SYSTEM WIRING DIAGRAM SBR 1
80636
C
5



SBD2 =2 SBD4 30=4 SBD4 45=4 SBD4 60=6	MAXIMUM POSSIBLE CONFIGURATION (SEE NOTE 2)	
ALL 1 MODEL	MIXED MODELS	WITH REGEN
2222222	422222	42222R
4444	44222	4422R
66	4442	444R
	62222	6222R
	662	66R
	6442	644R
	6422	642R

NOTES:

1. FRAME CONFIGURATION NUMBERS INDICATE ORDER OF SBD'S TO BE PLACED IN FRAME ASSEMBLY. STARTING ON RIGHT SIDE CLOSEST TO POWER SUPPLY.
2. MAXIMUM CONFIGURATION SHOULD NOT EXCEED THE LOGIC SUPPLY CAPABILITY OF 2.4 AMPS. INDIVIDUAL REQUIREMENTS ARE AS FOLLOWS:
   SBD2-.325 AMP, SBD4-.6 AMP, RDP-.15 AMP, REGEN - 0 AMP.

KC INDUSTRIAL DRIVES DIVISION RADFORD, VIRGINIA

OUTLINE & DIMENSION
SBFP3 23.5-INCH FRAME

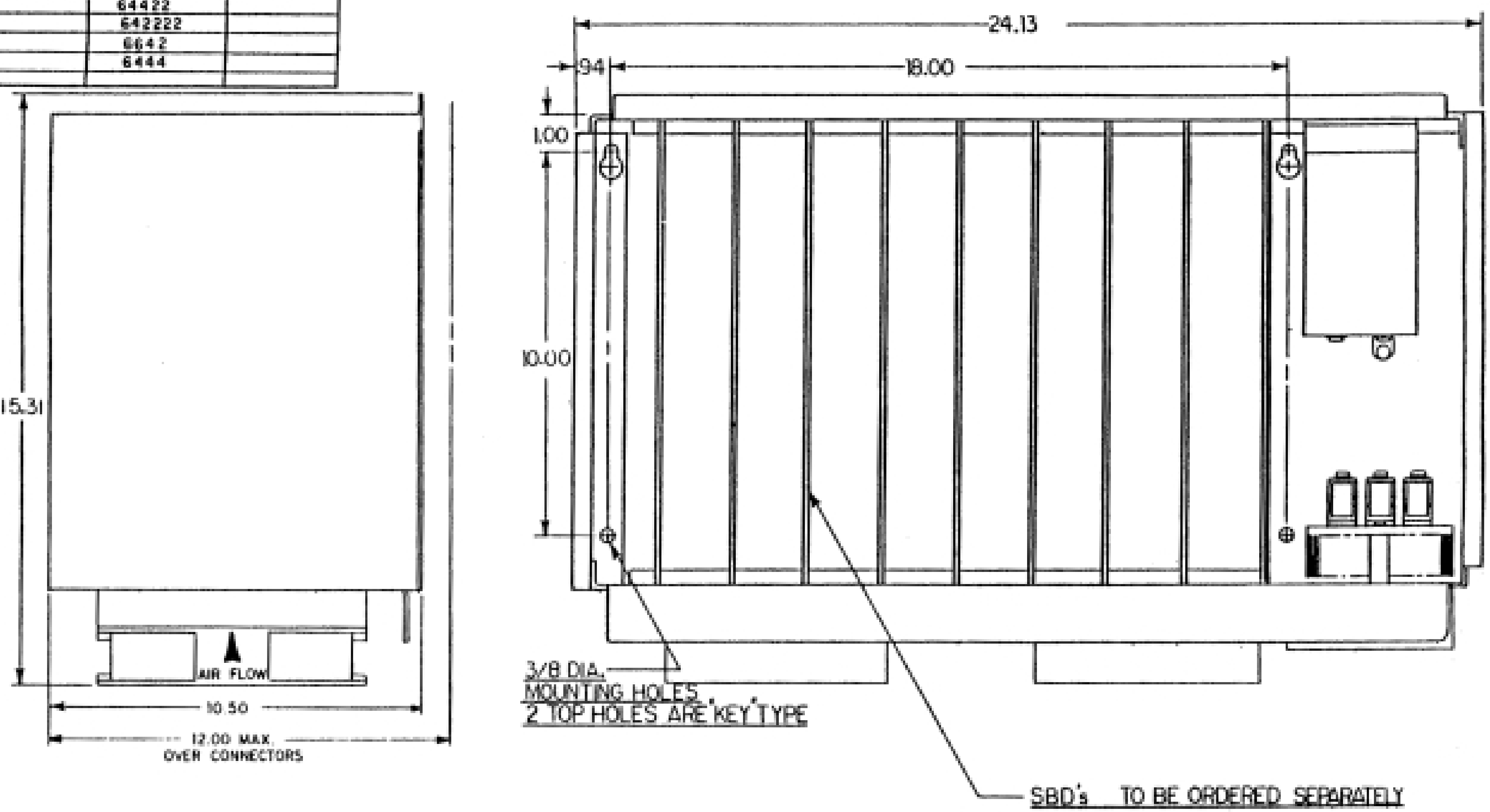
DWG SIZE C — DWG NO. 80717 — ISSUE 3

FBD2 = 2
SBD4 30 = 4
SBD4 45 = 4
SBD4 60 = 6

MAXIMUM POSSIBLE CONFIGURATION

ALL 1 MODEL	MIXED MODELS
222222222	4222222
4444	442222
666	44422
	6222222
	66222
	64422
	642222
	6642
	6444

NOTES:
1. FRAME CONFIGURATION NUMBERS INDICATE ORDER OF SBD'S TO BE PLACED IN FRAME ASSEMBLY. STARTING ON RIGHT SIDE CLOSEST TO POWER SUPPLY.



OUTLINE & DIMENSION
SBFH3 24-INCH FRAME
C 81119 3

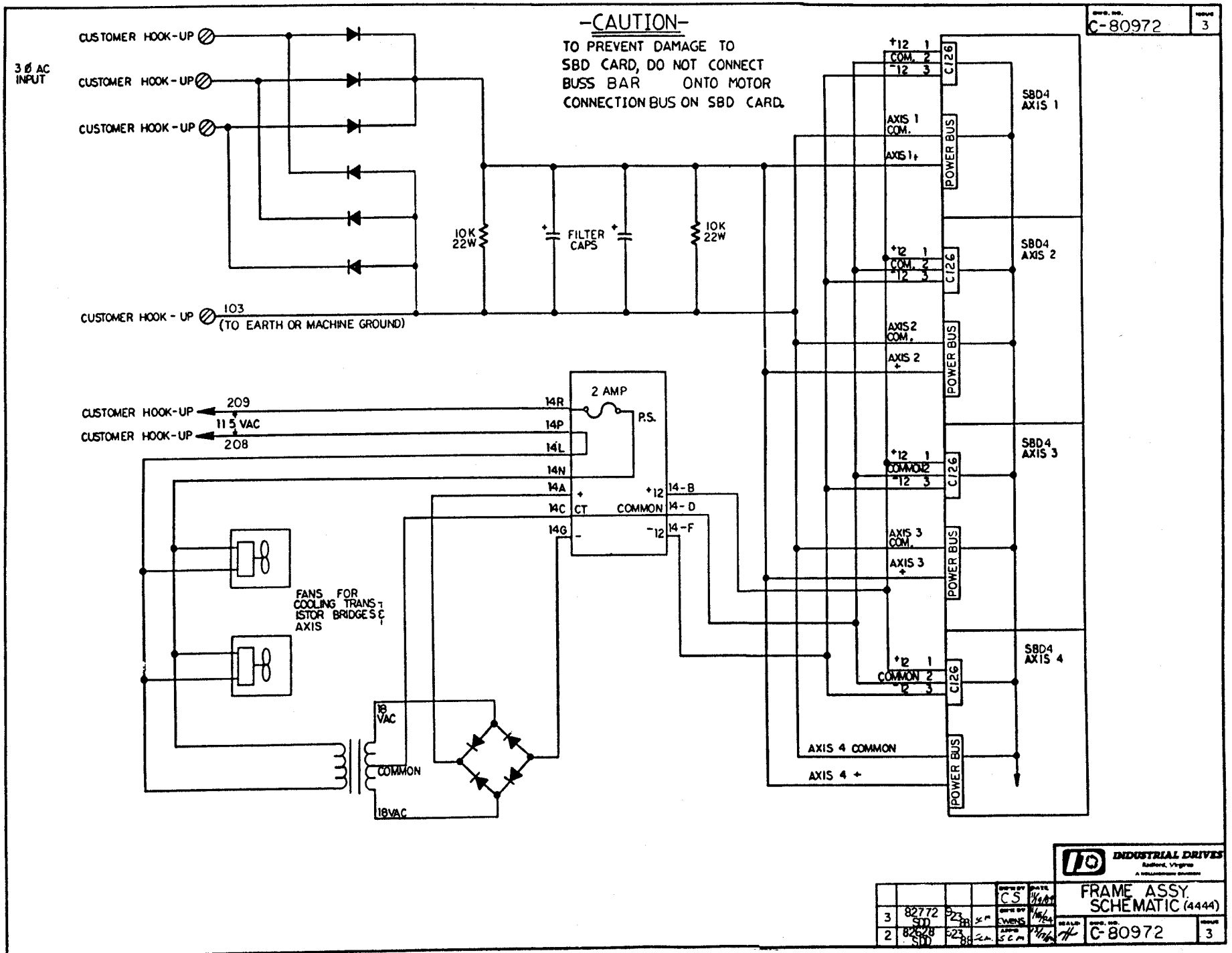
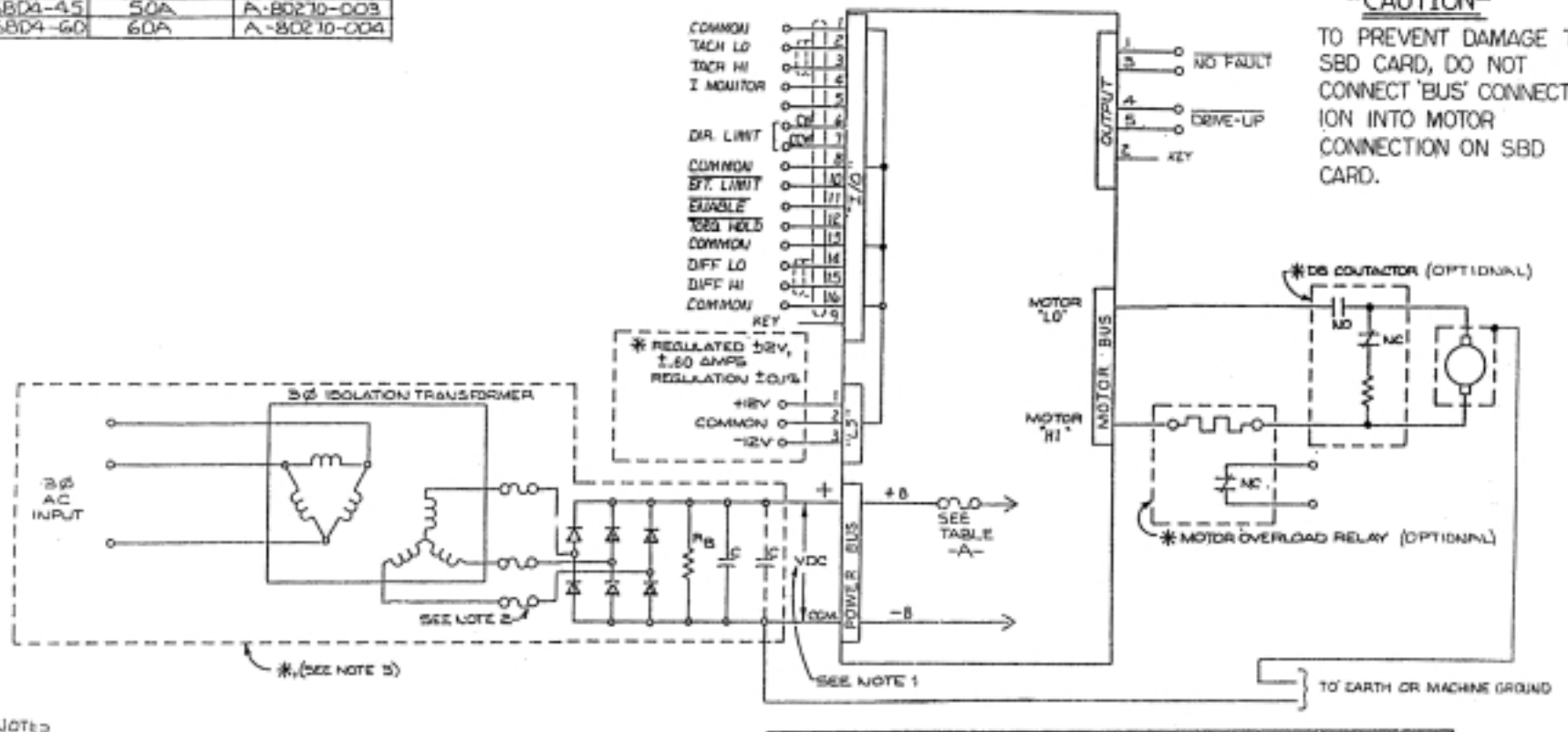

-CAUTION-
TO PREVENT DAMAGE TO SBD CARD, DO NOT CONNECT BUSS BAR ONTO MOTOR CONNECTION BUS ON SBD CARD.
C-80972
3
3 Ø AC INPUT
CUSTOMER HOOK-UP
CUSTOMER HOOK-UP
CUSTOMER HOOK-UP
CUSTOMER HOOK-UP
103
(TO EARTH OR MACHINE GROUND)
10K 22W
FILTER CAPS
10K 22W
CUSTOMER HOOK-UP
209
115 VAC
208
CUSTOMER HOOK-UP
2 AMP
P.S.
14R
14P
14L
14N
14A
14C
14G
CT
+12
COMMON
-12
14-B
14-D
14-F
FANS FOR COOLING TRANSISTOR BRIDGES OF AXIS
18 VAC
COMMON
18VAC
+12 1
COM. 2
-12 3
C126
POWER BUS
SBD4 AXIS 1
AXIS 1 COM.
AXIS 1 +
SBD4 AXIS 2
AXIS 2 COM.
AXIS 2 +
SBD4 AXIS 3
AXIS 3 COM.
AXIS 3 +
SBD4 AXIS 4
AXIS 4 COMMON
AXIS 4 +
INDUSTRIAL DRIVES
FRAME ASSY. SCHEMATIC (4444)
C-80972
3
82772 SDD
82628 SDD

TABLE - A -		
AMP	FUSE VALUE	IDD NO.
SBD4-30	35A.	A-80210-001
SBD4-45	50A	A-80210-003
SBD4-60	60A	A-80210-004



-CAUTION-

TO PREVENT DAMAGE TO SBD CARD, DO NOT CONNECT 'BUS' CONNECTION INTO MOTOR CONNECTION ON SBD CARD.

NOTES

* CUSTOMER FURNISHED

① VDC = 90-225VDC
THE SELECTION OF THE SIZE AND VOLTAGE RATING OF C IS A FUNCTION OF THE SYSTEM REQUIREMENT WITH THE FOLLOWING GENERAL RULES:

A) THE CAPACITANCE VALUE SHOULD LIMIT THE RATIO OF THE PEAK TO AVERAGE VOLTAGE TO 10% OR LESS.

B) THE CAPACITANCE VALUE SHOULD LIMIT THE BUS TO A 10 TO 15% DROP DURING HIGH ACCEL. OPERATION.

C) THE CAPACITANCE VALUE SHOULD LIMIT THE RISE IN THE BUS VOLTAGE DURING MOTOR DECEL. TO AN ADDITIONAL 40 VOLTS ABOVE ITS NORMAL VALUE.

② INPUT FUSES SHOULD BE SELECTED FOR SYSTEM REQUIREMENTS.

③ CUSTOMER FURNISHED BUS SUPPLY AND TRANSFORMER. THIS SUPPLY MAY BE EITHER 1Ø OR 3Ø, DEPENDING ON APPLICATION. THE BUS SUPPLY INDICATED IS FOR REFERENCE ONLY. (AVAILABLE FROM INDUSTRIAL DRIVES)

④ THE STANDARD SINGLE BOARD AMPLIFIER WILL HAVE A RELAY OUTPUT FOR DRIVE-UP AND NO FAULT CONDITION.

RELAY — 1AMP 28 VDC RESISTIVE OR .5AMP 120 VAC RESISTIVE.

⑤ SHIELDS ARE TO BE TERMINATED TO EITHER THE N.C. GROUND OR I/O CONNECTOR BUT NOT TO BOTH. ONE END OF SHIELD TO BE OPEN AND INSULATED.

CONNECTOR	FUNCTION	RELAY	OPERATIONAL DESCRIPTION	STD. OR OPT. FUNCTION
"I/O"	ENABLE	NO	CLOSE TO ENABLE	STANDARD INPUT
	TORQ. HOLD	NO	CLOSE TO ENABLE	STANDARD INPUT
	EXT. LIMIT	NO	CLOSE TO ENABLE	STANDARD INPUT
	DIR. LIMIT CW	NC	OPEN TO INHIBIT	OPTIONAL INPUT
	DIR. LIMIT CCW	NC	OPEN TO INHIBIT	OPTIONAL INPUT
OUTPUT	NO FAULT	NO	CLOSE FOR NO FAULT DETECTED AND NOT IN A FOLDBACK CONDITION.	STANDARD OUTPUT
	DRIVE-UP	NO	CLOSE FOR NO FAULT DETECTED AND AMPLIFIER ENABLED.	STANDARD OUTPUT

ALL INPUT FUNCTIONS REQUIRE SINK OF 2 ma @ .4 VOLTS WHEN CLOSED.

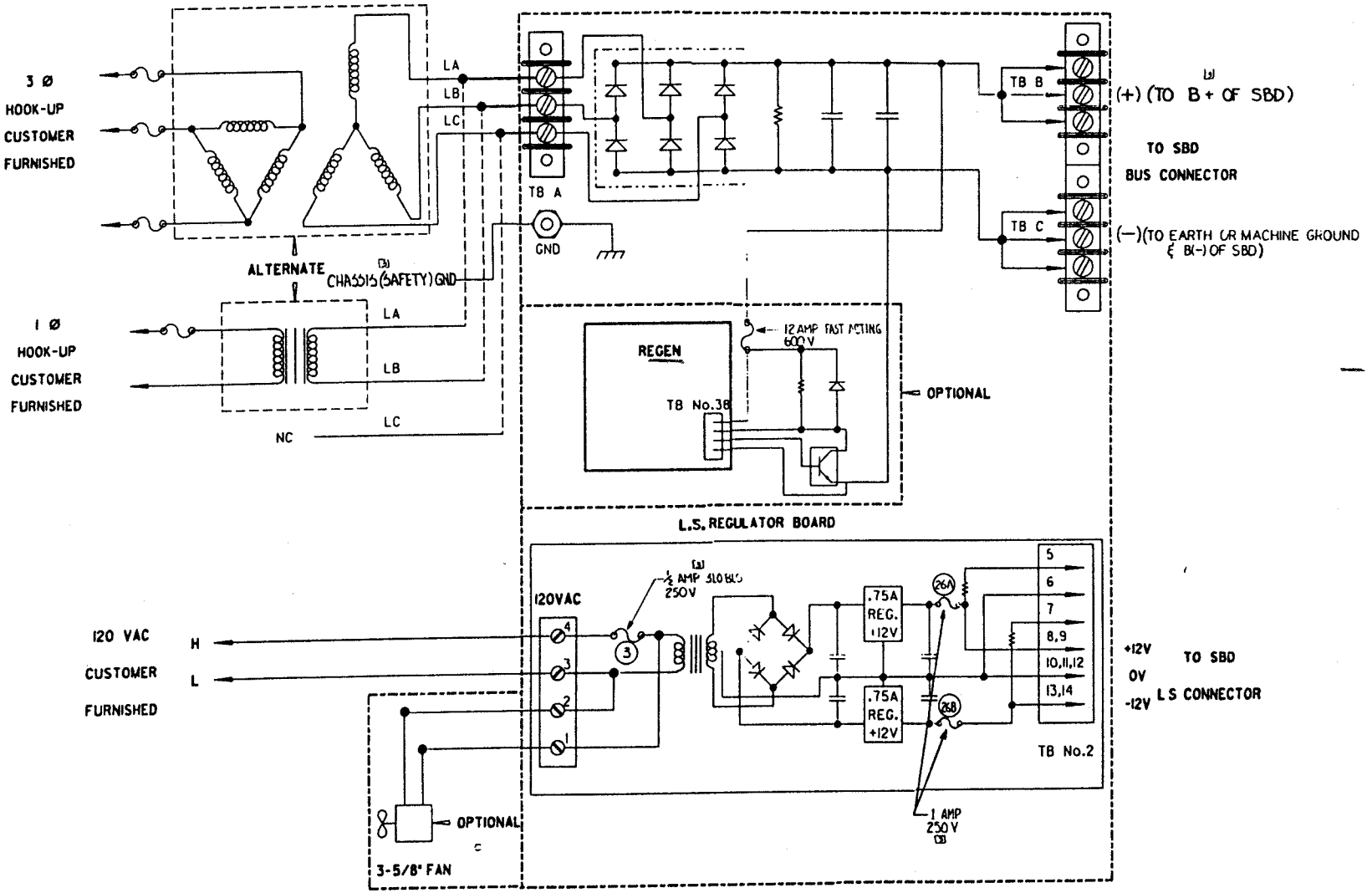
B	SYSTEM DRAWING		
A-1	ADD TORQ. HOLD		
5	GENERAL REVISIONS		
4	ADDED OMENS		
3	ADDED CLEARANCE		
2	ADDED CLEARANCE		

COPY CODE

INDUSTRIAL DRIVES

SYSTEM WIRING DIAGRAM SBD4

DWG. NO. C-81332 SHT. 1 OF 1 REV. 78



NOTES:

1) LONG & SHORT DASH LINE SHOWS VENDOR FURNISHED COMPONENTS AND VENDOR CONNECTIONS.
2) COMPONENTS AND CONNECTIONS OUTSIDE THIS LINE ARE TO BE CUSTOMER FURNISHED.
3) AIR FLOW FROM FAN SHOULD BE TOWARD SBD AMP, WHICH SHOULD BE MOUNTED TO THE LEFT OF THE POWER SUPPLY S3PI-15

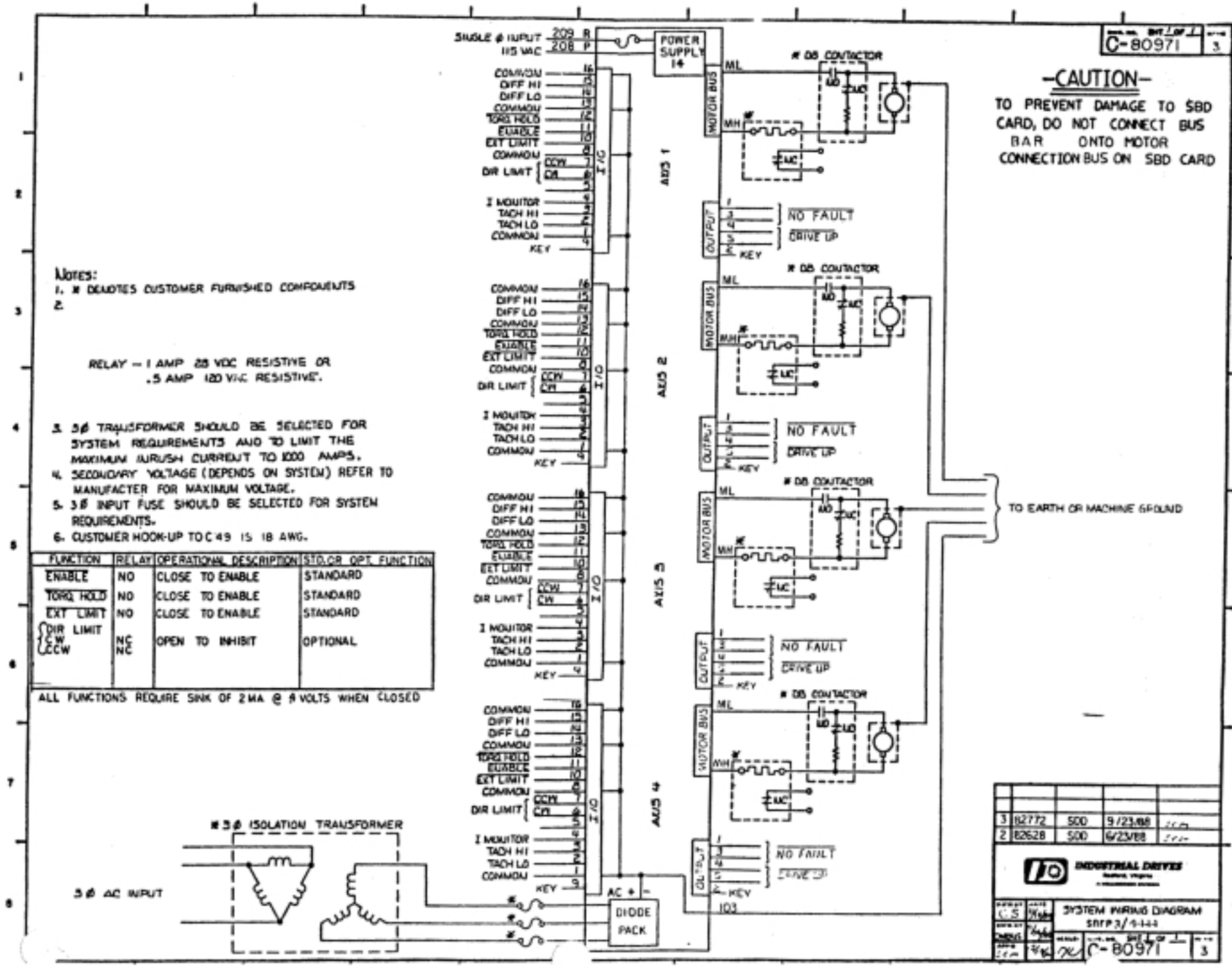
DO NOT SCALE DRG. USE DIMENSIONS ONLY ALL DIMENSIONS ARE INCHES UNLESS OTHERWISE SPECIFIED	UNLESS OTHERWISE SPECIFIED XX DEC. PLACES ± .06 XXX DEC. PLACES ± .005 ANG. DIM ± 1 DEGREES	UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS AND BREAK ALL SHARP EDGES	DWG. SIZE C	DWG. NO. 81606	SH. 4

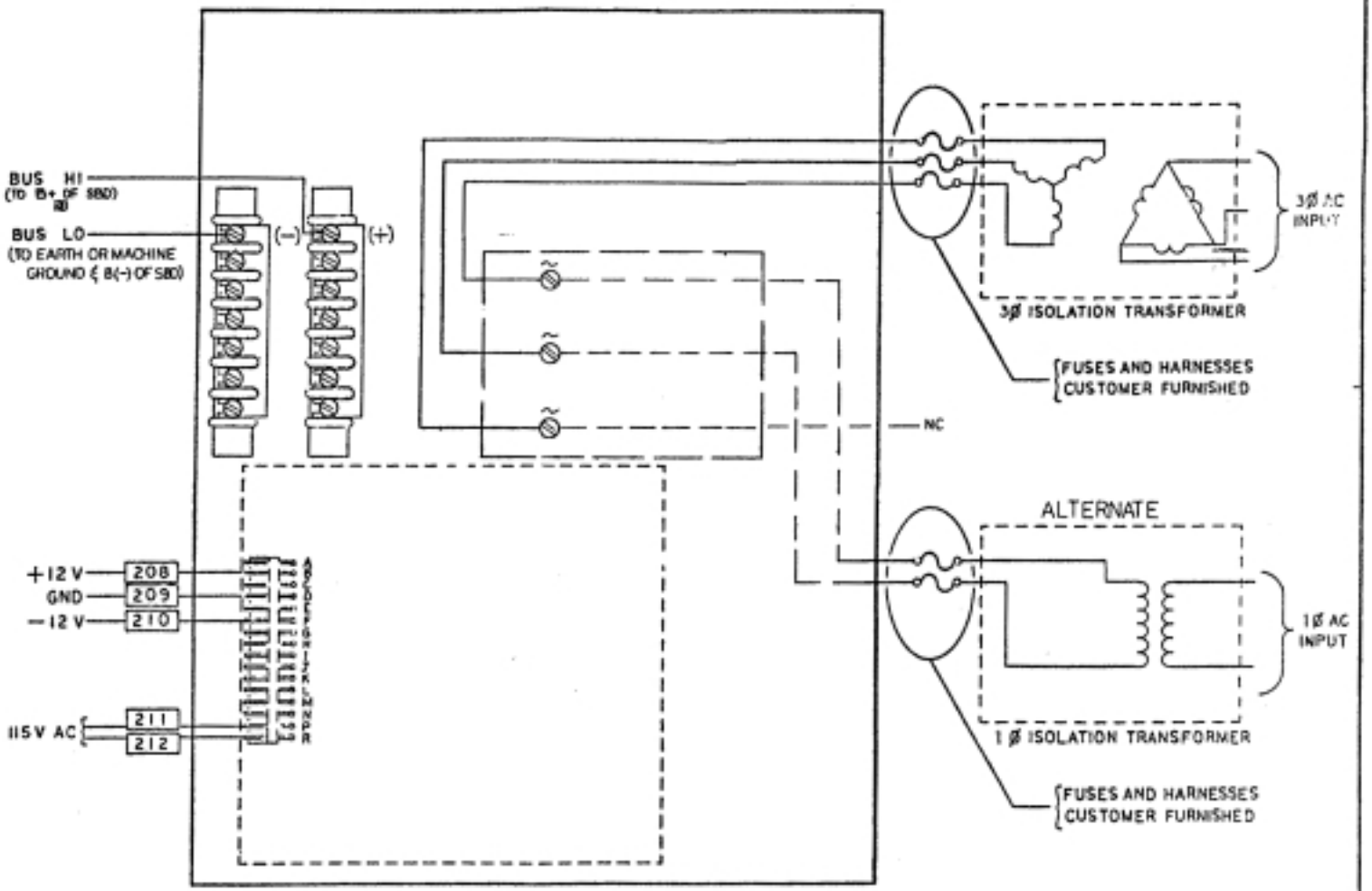
MATERIAL				HEAT TREAT			FINISH						
NO.	ECN NO.	DATE	APP'D	NO.	ECN NO.	DATE	APP'D	NO.	ECN NO.	DATE	APP'D	DRN BY CS	DATE 10-28-1985
								2	82392 OWENS	11/4/87	SCM	CHK'D BY	
								3	82647 ENR	1/28/88	SCM	APP'D BY SCM	1/29/88
								4	82712 SDD	4/23/90	SCM	SCALE NONE	

INDUSTRIAL DRIVES
Radford, Virginia

SYSTEM & INTERNAL WIRING SBPI-15

DWG. SIZE C DWG. NO. 81606 ISS. 4

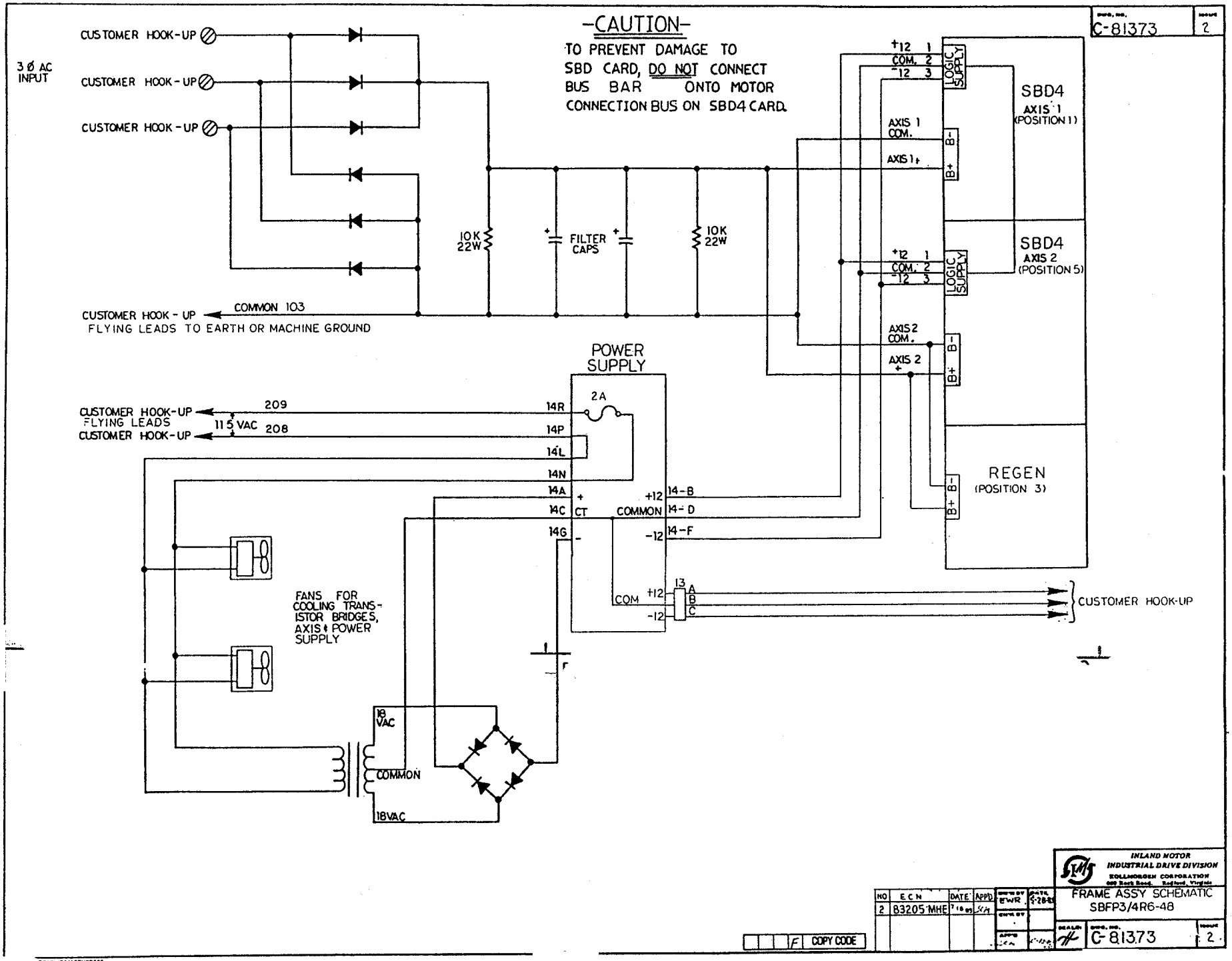

C-80971
-CAUTION-
TO PREVENT DAMAGE TO SBD CARD, DO NOT CONNECT BUS BAR ONTO MOTOR CONNECTION BUS ON SBD CARD
SINGLE Ø INPUT 115 VAC
POWER SUPPLY I4
DB CONTACTOR
MOTOR BUS
NO FAULT
DRIVE UP
TO EARTH OR MACHINE GROUND
AXIS 1
AXIS 2
AXIS 3
AXIS 4
I/O
DIODE PACK
3Ø ISOLATION TRANSFORMER
3Ø AC INPUT
Notes:
1. # DENOTES CUSTOMER FURNISHED COMPONENTS
2.
RELAY – 1 AMP 28 VDC RESISTIVE OR .5 AMP 120 VAC RESISTIVE.
3. 3Ø TRANSFORMER SHOULD BE SELECTED FOR SYSTEM REQUIREMENTS AND TO LIMIT THE MAXIMUM INRUSH CURRENT TO 1000 AMPS.
4. SECONDARY VOLTAGE (DEPENDS ON SYSTEM) REFER TO MANUFACTER FOR MAXIMUM VOLTAGE.
5. 3Ø INPUT FUSE SHOULD BE SELECTED FOR SYSTEM REQUIREMENTS.
6. CUSTOMER HOOK-UP TO C49 IS 18 AWG.
FUNCTION | RELAY | OPERATIONAL DESCRIPTION | STD OR OPT. FUNCTION
ENABLE | NO | CLOSE TO ENABLE | STANDARD
TORQ HOLD | NO | CLOSE TO ENABLE | STANDARD
EXT LIMIT | NO | CLOSE TO ENABLE | STANDARD
DIR LIMIT CW | NC | OPEN TO INHIBIT | OPTIONAL
DIR LIMIT CCW | NC | OPEN TO INHIBIT | OPTIONAL
ALL FUNCTIONS REQUIRE SINK OF 2 MA @ 8 VOLTS WHEN CLOSED
3 | 82772 | 500 | 9/23/88
2 | 82628 | 500 | 6/23/88
INDUSTRIAL DRIVES
SYSTEM WIRING DIAGRAM
C-80971

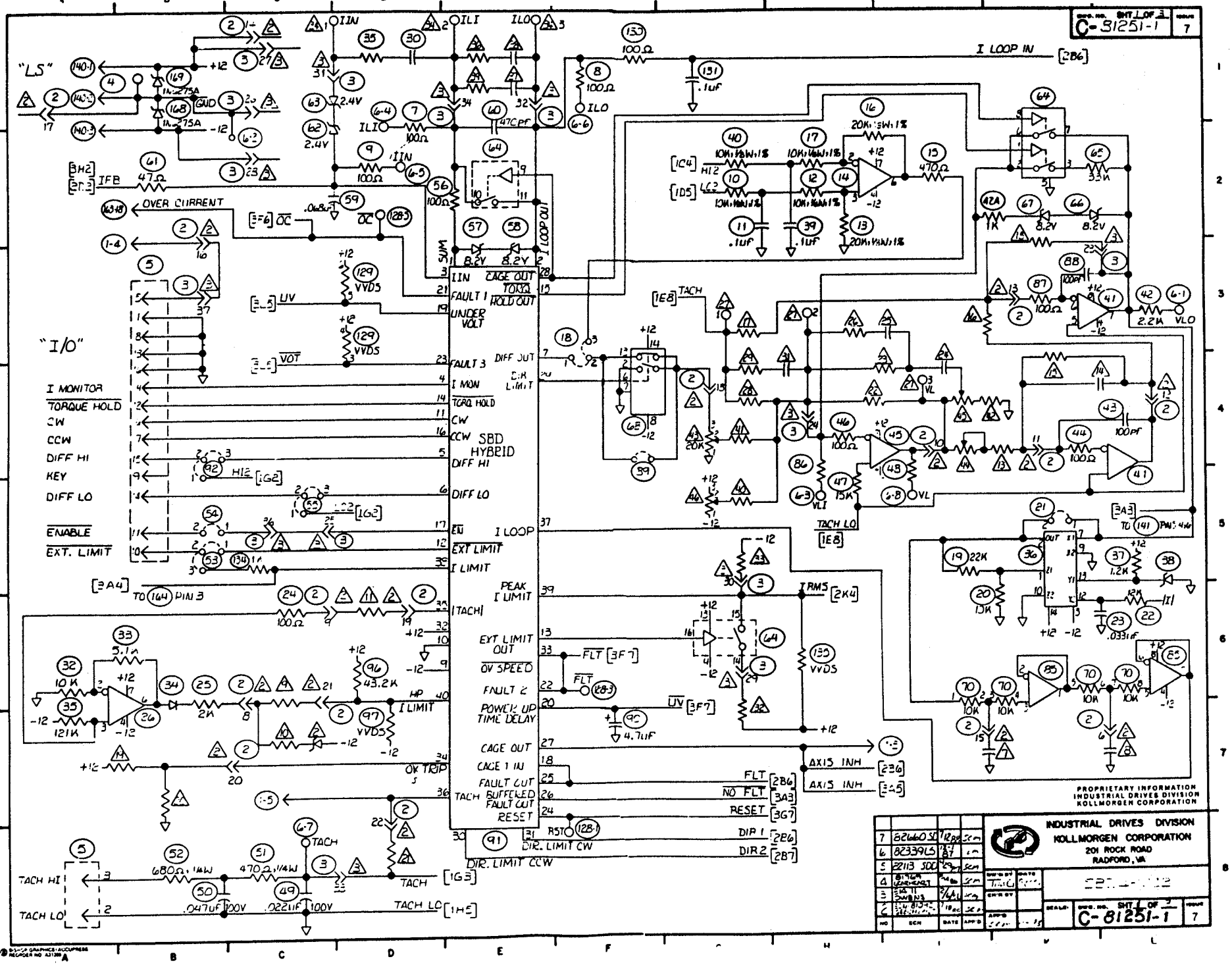


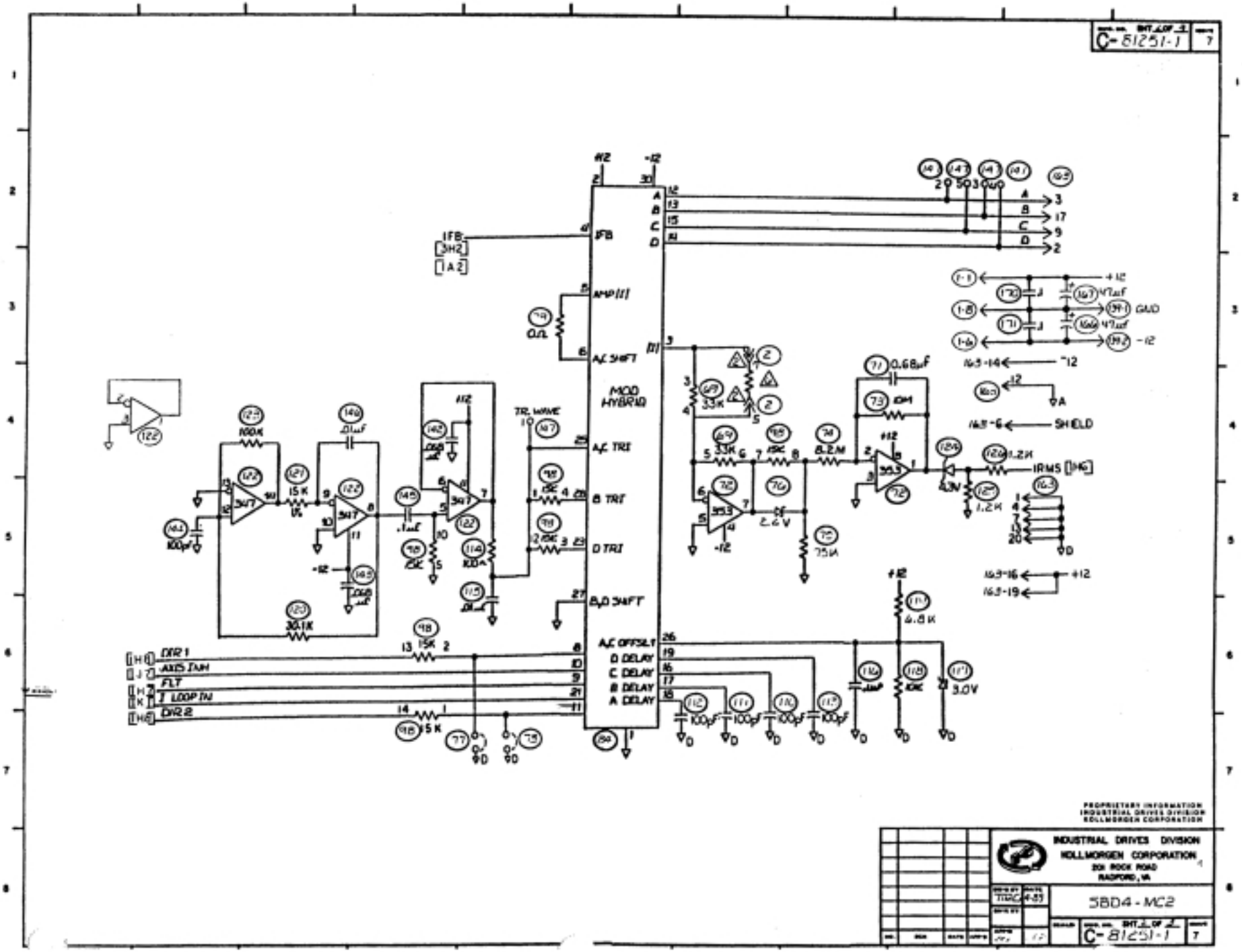
INDUSTRIAL DRIVES

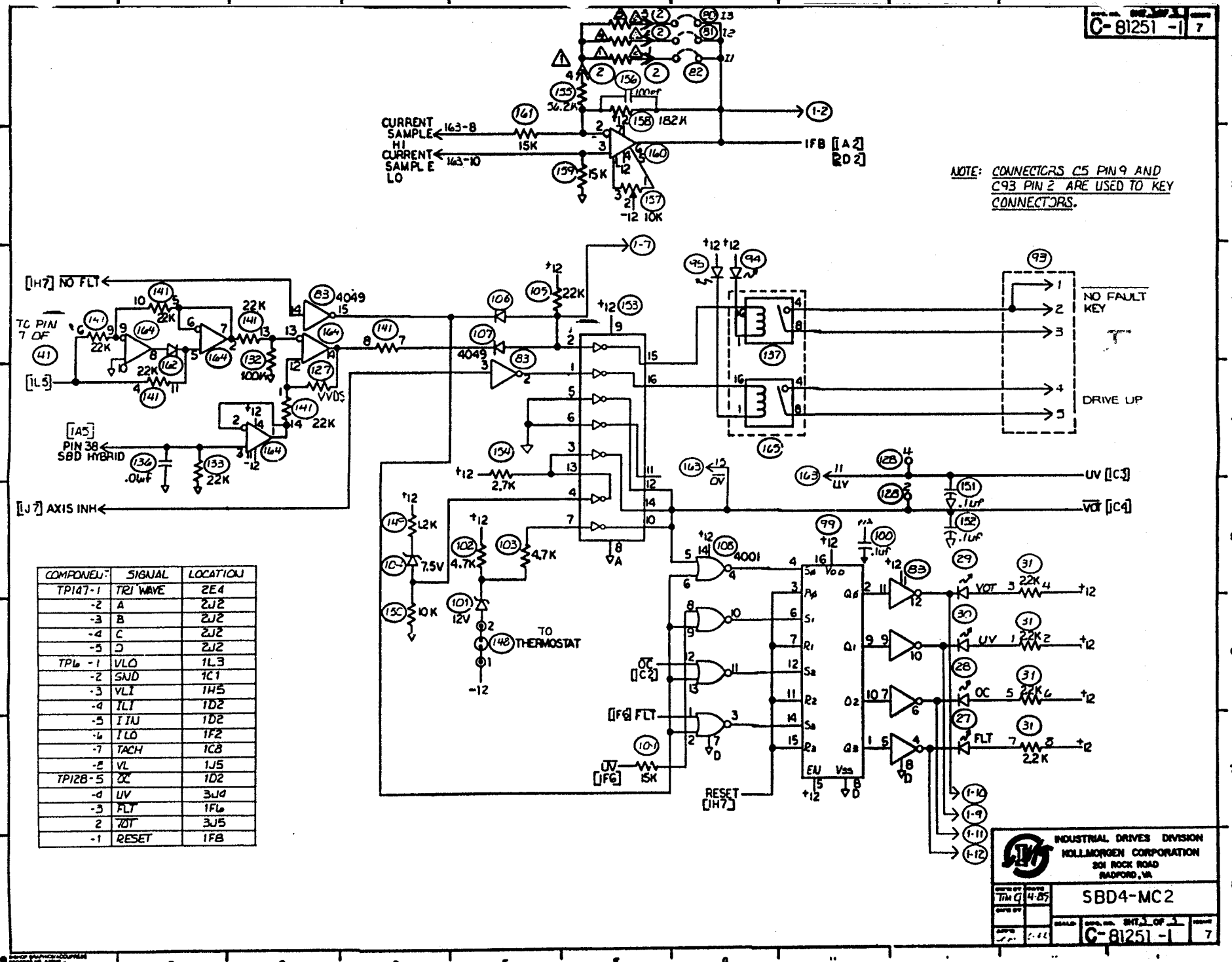
SYSTEM WIRING
DIAG. SBP1-48-13000

C 80770 4


-CAUTION-
TO PREVENT DAMAGE TO SBD CARD, DO NOT CONNECT BUS BAR ONTO MOTOR CONNECTION BUS ON SBD4 CARD.
C-81373
2
3 Ø AC INPUT
CUSTOMER HOOK-UP
CUSTOMER HOOK-UP
CUSTOMER HOOK-UP
10K 22W
FILTER CAPS
10K 22W
COMMON 103
CUSTOMER HOOK-UP
FLYING LEADS TO EARTH OR MACHINE GROUND
+12 1
COM. 2
-12 3
LOGIC SUPPLY
SBD4
AXIS 1
(POSITION 1)
AXIS 1 COM.
AXIS 1 +
B-
B+
SBD4
AXIS 2
(POSITION 5)
AXIS 2 COM.
AXIS 2 +
REGEN
(POSITION 3)
POWER SUPPLY
2A
CUSTOMER HOOK-UP
FLYING LEADS
CUSTOMER HOOK-UP
209
115 VAC
208
14R
14P
14L
14N
14A
14C
14G
CT
+12
COMMON
-12
14-B
14-D
14-F
FANS FOR COOLING TRANSISTOR BRIDGES, AXIS & POWER SUPPLY
13
A
B
C
CUSTOMER HOOK-UP
18 VAC
COMMON
18VAC
INLAND MOTOR
INDUSTRIAL DRIVE DIVISION
KOLLMORGEN CORPORATION
FRAME ASSY SCHEMATIC
SBFP3/4R6-48
C-81373
2
NO
E C N
DATE
APP'D
2
83205 MHE
COPY CODE


C-81251-1
7
"LS"
"I/O"
I LOOP IN [2B6]
IFB
OVER CURRENT
OC
UV
VOT
I MONITOR
TORQUE HOLD
CW
CCW
DIFF HI
KEY
DIFF LO
ENABLE
EXT. LIMIT
SBD HYBRID
IIN
FAULT 1
UNDER VOLT
FAULT 3
I MON
TORQ HOLD
CCW
DIFF HI
DIFF LO
EN
EXT LIMIT
I LIMIT
TACH
EXT LIMIT OUT
OV SPEED
FAULT 2
POWER UP TIME DELAY
CAGE OUT
CAGE 1 IN
FAULT OUT
TACH BUFFERED FAULT OUT
RESET
DIR. LIMIT CW
DIR. LIMIT CCW
CAGE OUT
TORQ HOLD OUT
DIFF OUT
D/K LIMIT
I LOOP
PEAK I LIMIT
I RMS
I LIMIT
OV TRIP
VVDS
FLT
NO FLT
RESET
DIR 1
DIR 2
AXIS INH
TACH HI
TACH LO
TACH
PROPRIETARY INFORMATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
C-81251-1
7

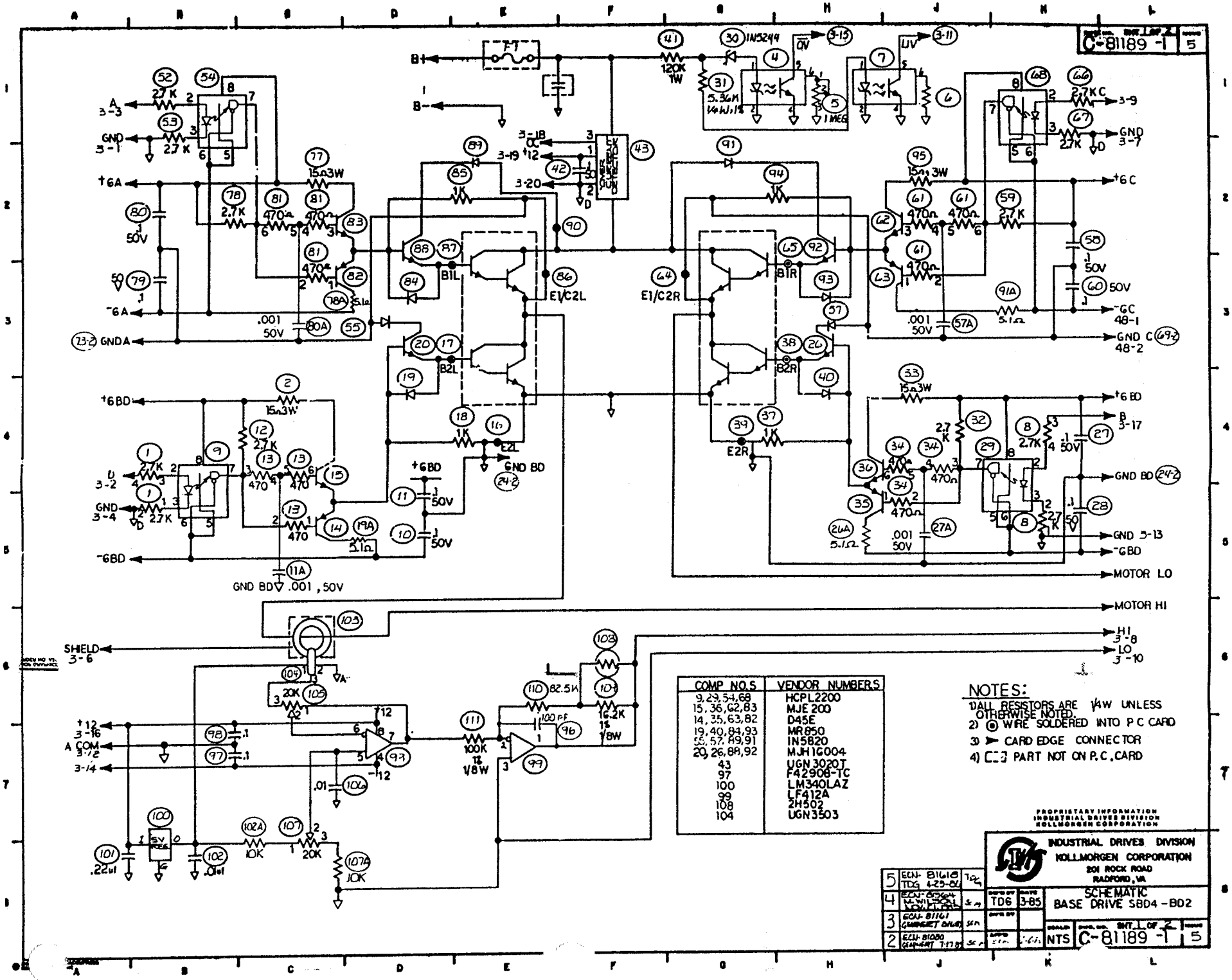

C-81251-1
MOD HYBRID
+12
-12
IFB
DIR 1
AXIS TAH
FLT
I LOOP IN
DIR 2
TR. WAVE
A TRI
B TRI
D TRI
A,D SHIFT
B,D SHIFT
A DELAY
B DELAY
C DELAY
D DELAY
A OFFSET
IRMS
SHIELD
GND
PROPRIETARY INFORMATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
5804-MC2
C-81251-1



COMPONENT	SIGNAL	LOCATION
TP147-1	TRI WAVE	2E4
-2	A	2J2
-3	B	2J2
-4	C	2J2
-5	D	2J2
TP6 -1	VLO	1L3
-2	SND	1C1
-3	VLI	1H5
-4	ILI	1D2
-5	IIN	1D2
-6	ILO	1F2
-7	TACH	1C8
-8	VL	1J5
TP128-5	OC	1D2
-6	UV	3J6
-3	FLT	1F6
2	VOT	3J5
-1	RESET	1F8

INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
501 ROCK ROAD
RADFORD, VA

DRAWN BY Tim G	DATE 4-87	SBD4-MC2
CHECKED BY		
APPROVED	SCALE	SHT 3 OF 3 C-81251 -1 7



COMP NO.S	VENDOR NUMBERS
9, 23, 54, 68	HCPL2200
15, 36, 62, 83	MJE 200
14, 35, 63, 82	D45E
19, 40, 84, 93	MR850
18, 57, 89, 91	IN5820
20, 26, 88, 92	MJH16004
43	UGN3020T
97	F42908-TC
100	LM340LAZ
99	LF412A
108	2N502
104	UGN3503

NOTES:
1) ALL RESISTORS ARE 1/4W UNLESS OTHERWISE NOTED.
2) ⊙ WIRE SOLDERED INTO P.C. CARD
3) ➤ CARD EDGE CONNECTOR
4) ⊏⊐ PART NOT ON P.C. CARD

PROPRIETARY INFORMATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION

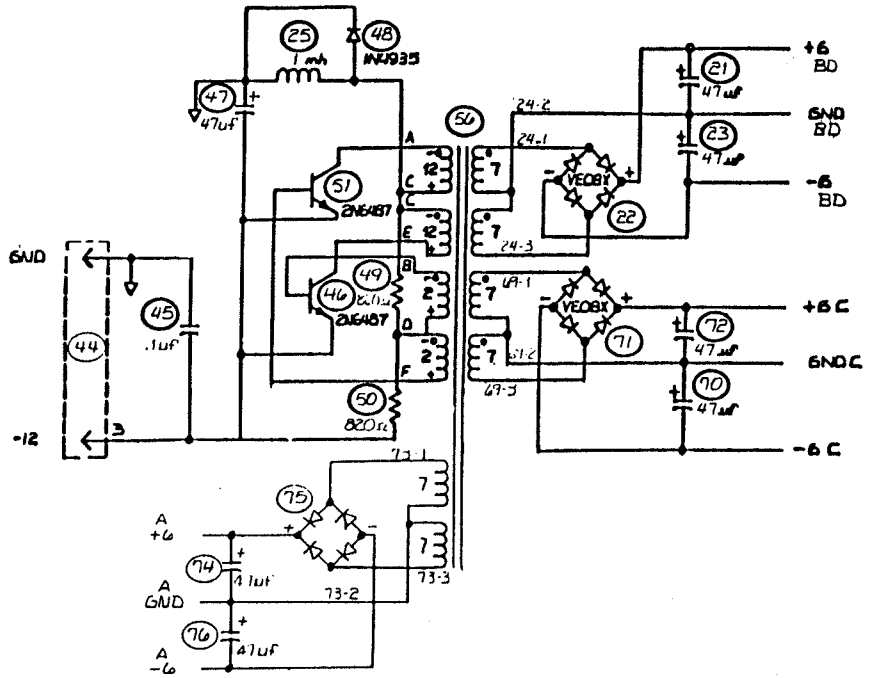
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA

SCHEMATIC
BASE DRIVE SBD4 - BD2

5	ECN- 81618 TDG 4-29-86	TDG	
4	ECN- 81564		
3	ECN- 81161		
2	ECN- 81080		

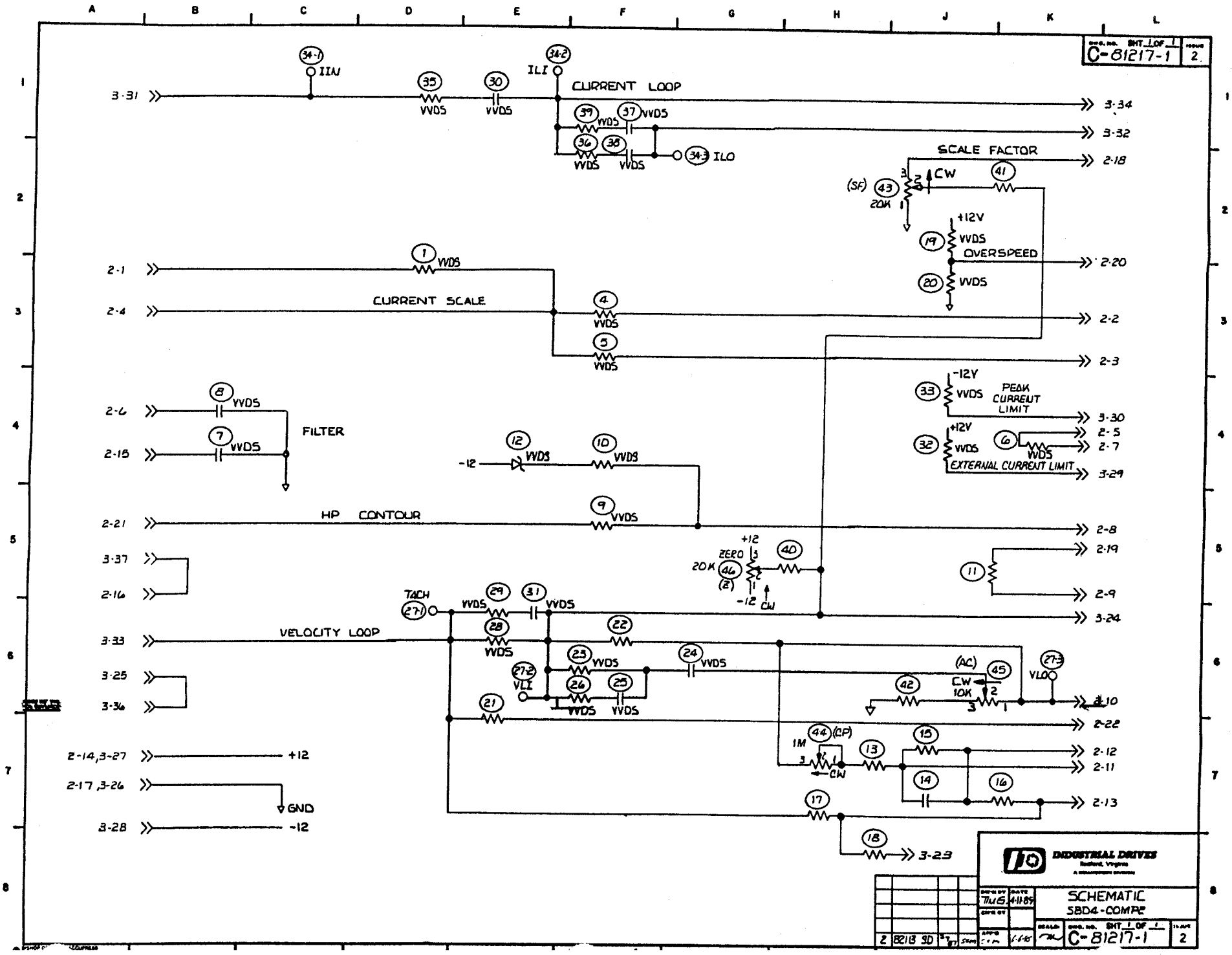
DRAWN BY TDG 3-85
SCALE NTS
DWG. NO. C-81189-1
SHT 1 OF 2
REV 5

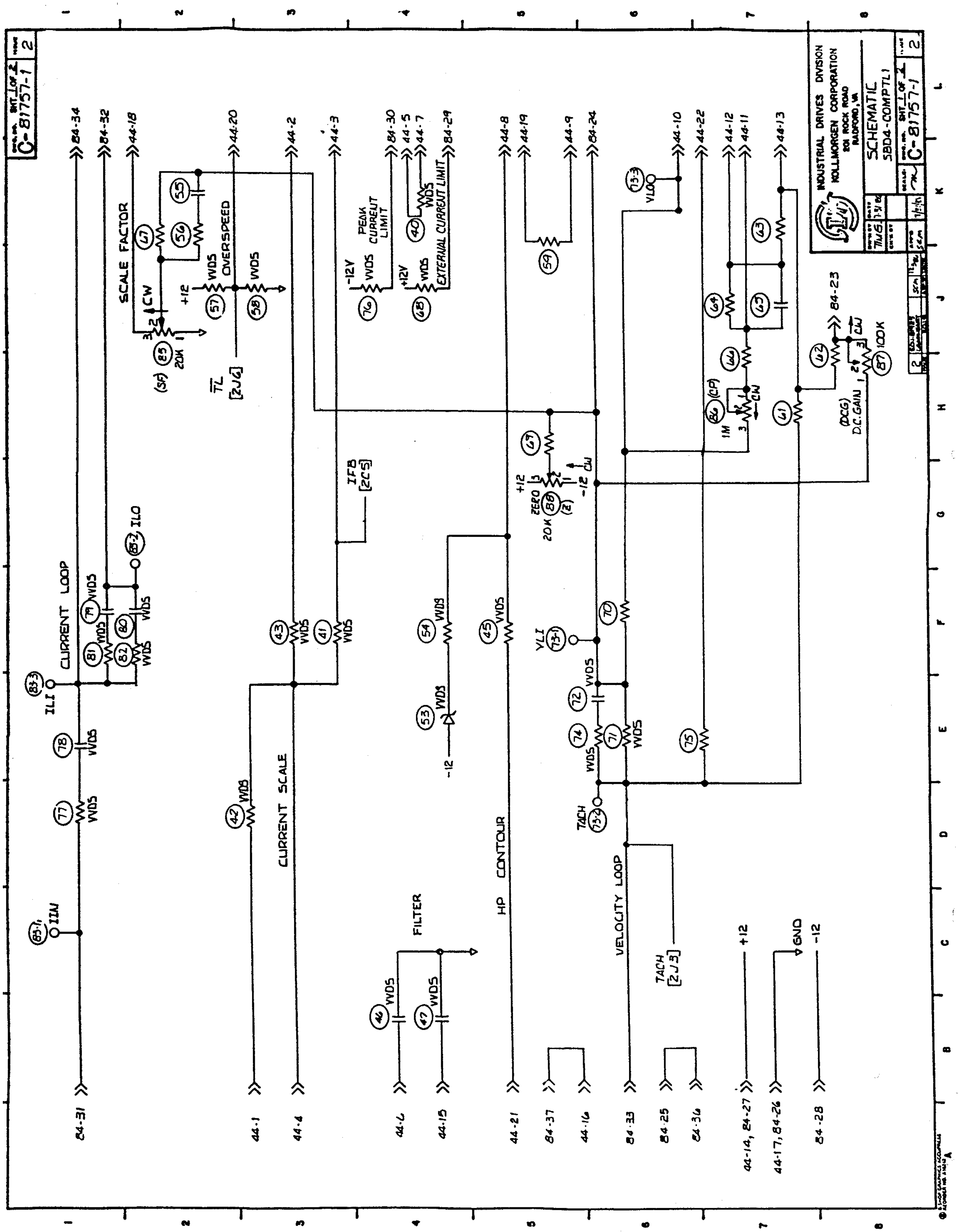
50

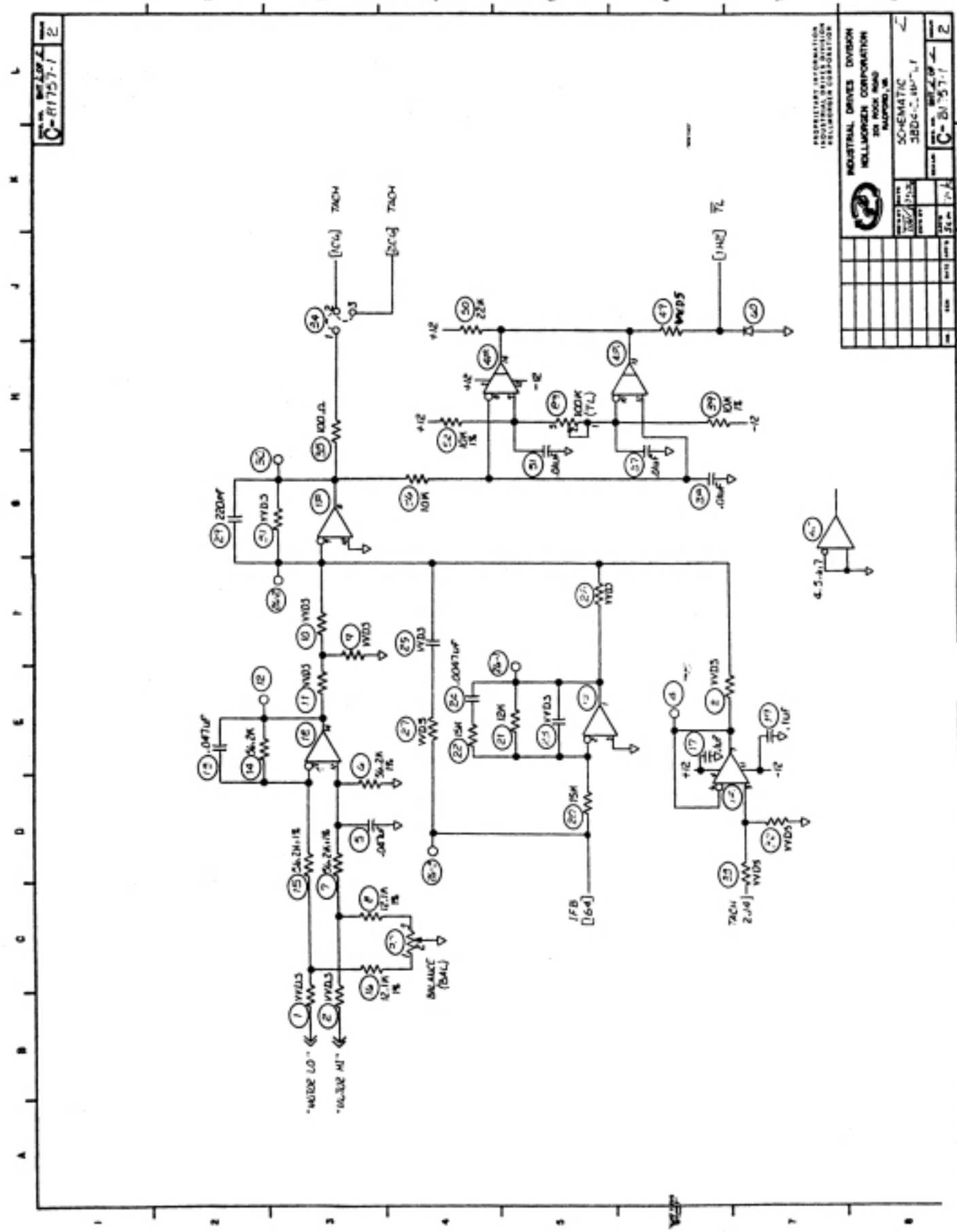


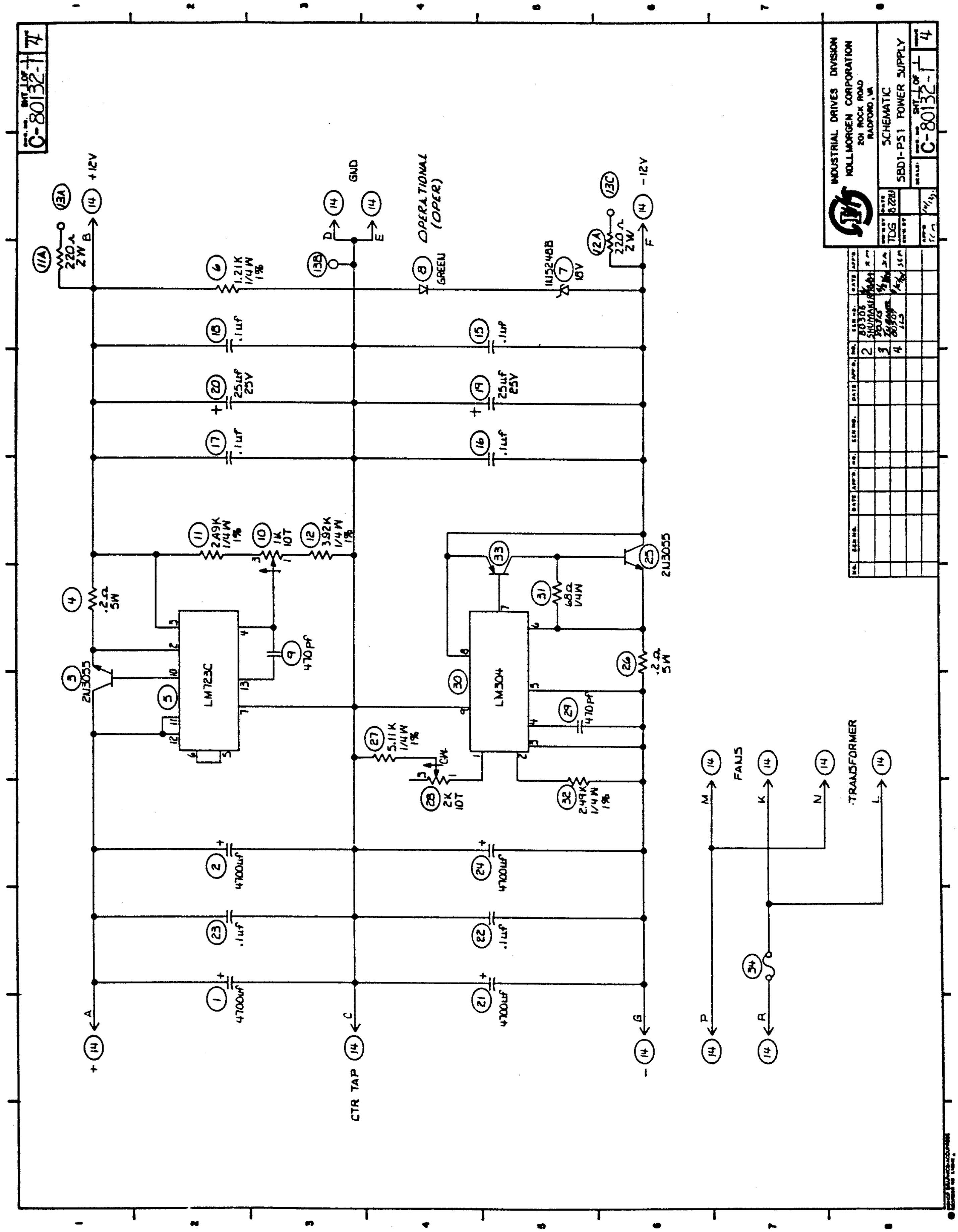
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA

SCHEMATIC
BASE DRIVE 5804-BD2

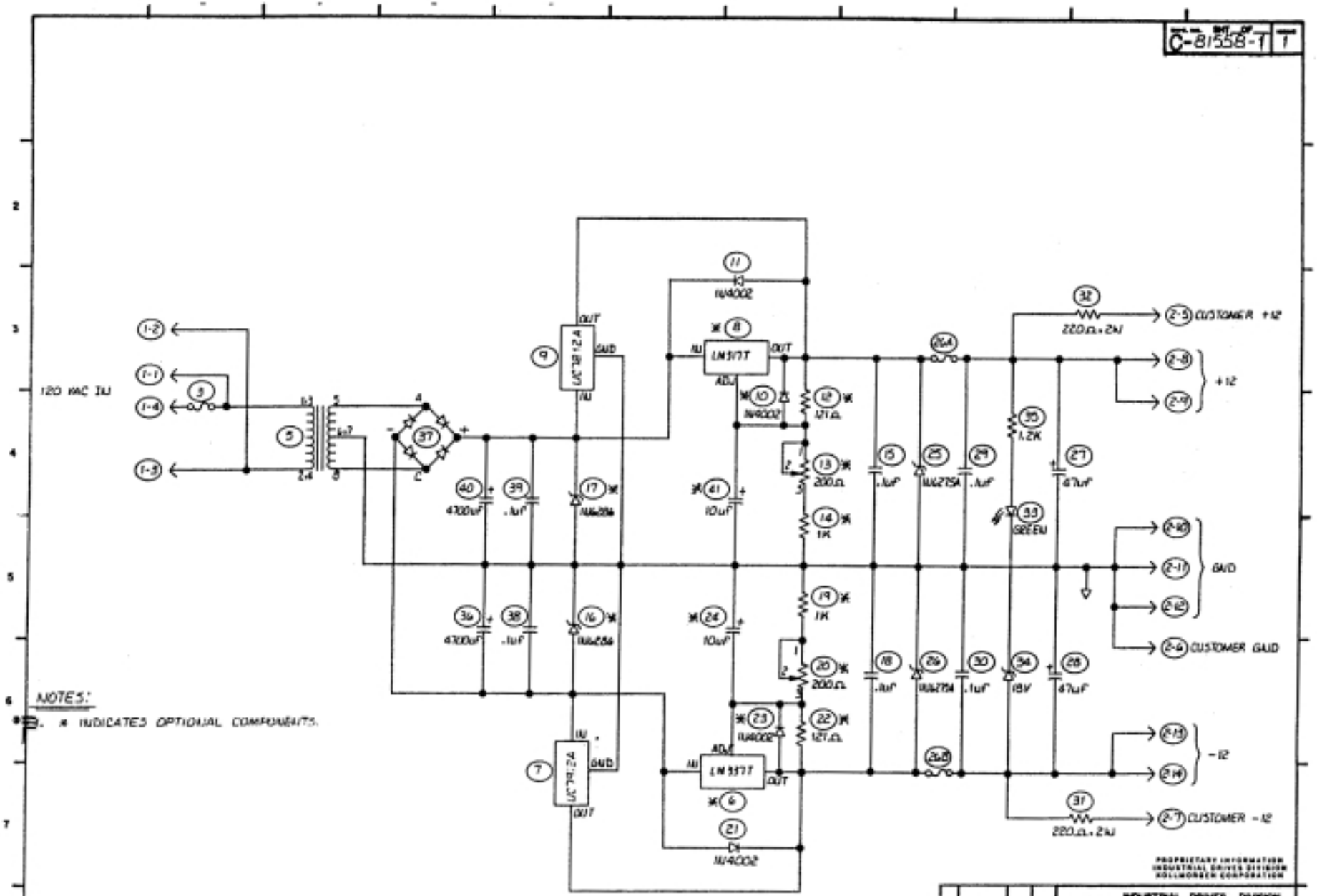

C-81217-1
IIN
ILI
CURRENT LOOP
ILO
SCALE FACTOR
CW
(SF)
20K
+12V
OVERSPEED
CURRENT SCALE
FILTER
-12V
PEAK CURRENT LIMIT
EXTERNAL CURRENT LIMIT
HP CONTOUR
ZERO
TACH
VELOCITY LOOP
(AC)
10K
(CP)
1M
GND
INDUSTRIAL DRIVES
SCHEMATIC
SBD4-COMPR
C-81217-1

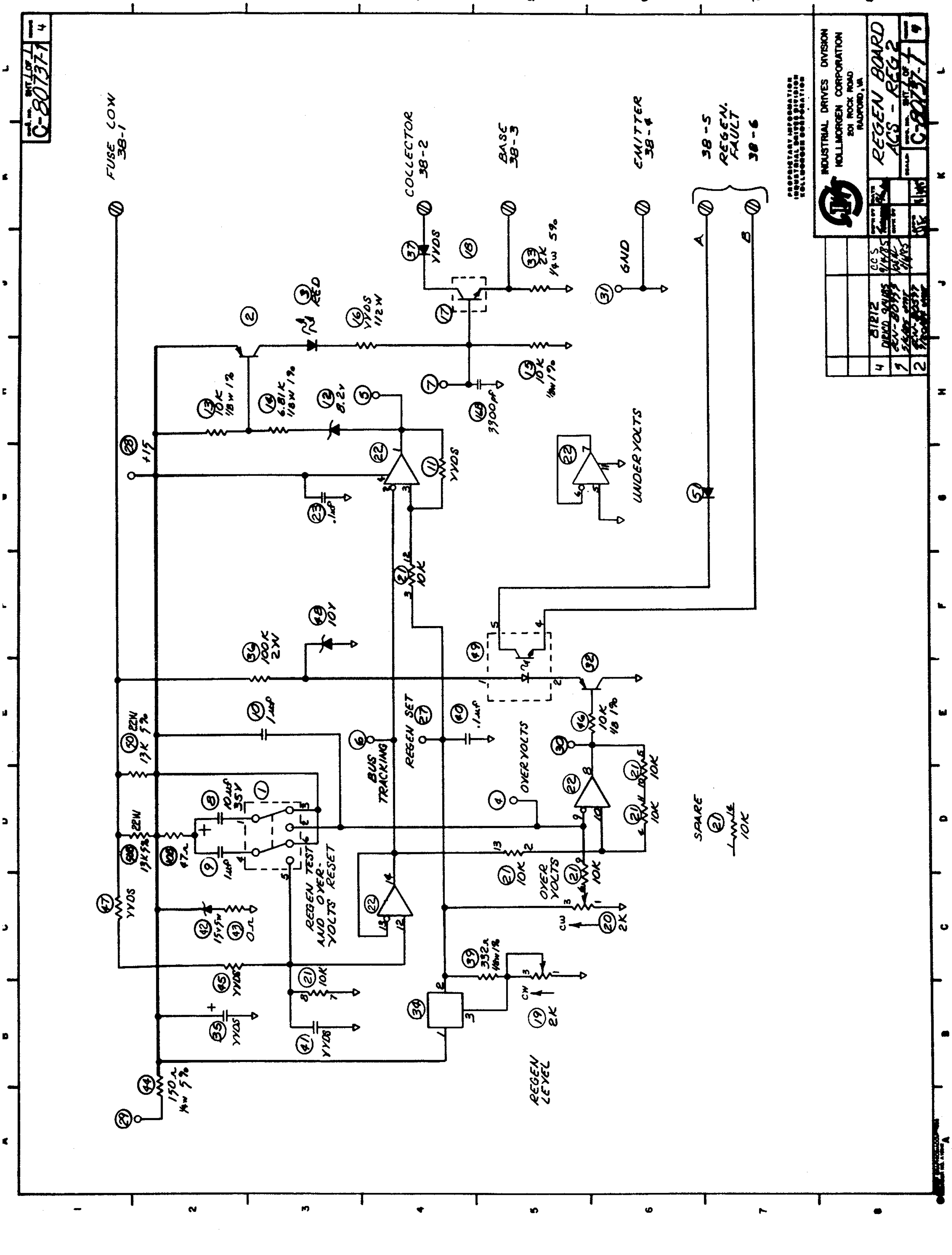

INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
SCHEMATIC
SBD4-COMPTL1
C-81757-1
CURRENT LOOP
CURRENT SCALE
FILTER
HP CONTOUR
VELOCITY LOOP
SCALE FACTOR
OVERSPEED
PEAK CURRENT LIMIT
EXTERNAL CURRENT LIMIT
ZERO
D.C. GAIN
TACH
GND





C-80132-1
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
SCHEMATIC
SBD1-PS1 POWER SUPPLY
+12V
GND
OPERATIONAL
(OPER)
-12V
LM723C
LM304
2N3055
FANS
TRANSFORMER
CTR TAP


120 VAC IN
NOTES:
1. * INDICATES OPTIONAL COMPONENTS.
+12
GND
-12
CUSTOMER +12
CUSTOMER GND
CUSTOMER -12
220Ω, 2W
1.2K
200Ω
1K
121Ω
4700uF
10uF
.1uF
47uF
15V
GREEN
1N4002
1N4728A
1N4734A
LM317T
LM337T
UC78L12A
UC79L12A
PROPRIETARY INFORMATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
SCHEMATIC
SBD-P32
C-81558-1
C-81558-T


INDUSTRIAL DRIVES DIVISION
KOLLMORGEN CORPORATION
201 ROCK ROAD
RADFORD, VA
REGEN BOARD
ACS - REG 2
C-80737-1
FUSE LOW 38-1
COLLECTOR 38-2
BASE 38-3
EMITTER 38-4
38-5 REGEN. FAULT 38-6
UNDERVOLTS
OVERVOLTS
BUS TRACKING
REGEN SET
REGEN TEST AND OVER-VOLTS RESET
REGEN LEVEL
SPARE