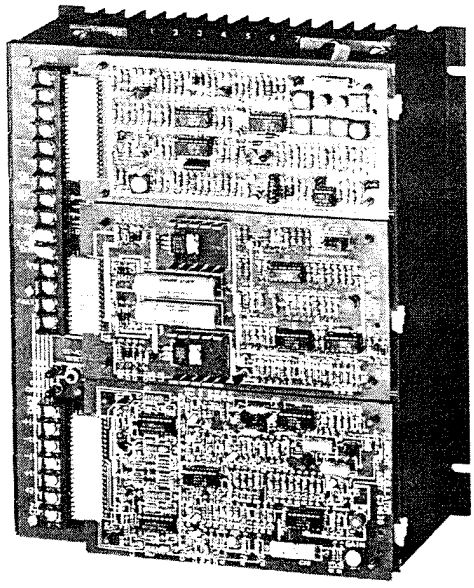
WARNER

INSTALLATION & OPERATION MANUAL

SECO® DC Drive

Quad R Regenerative DC Drives Models 6150, 6111, 6151

1/4 - 5 H.P. 115/230 VAC 1 Phase 50/60 Hz Input



WARNER ELECTRIC®

DANA

QUAD R INSTRUCTION MANUAL

For your safety and for proper operation, please take time to carefully read all instructions before installing and operating this unit.

QUAD R
REGENERATIVE DC DRIVES
INSTRUCTION MANUAL

1.0 GENERAL DESCRIPTION

The SECO/Dana Quad R Series of Regenerative DC Drives is a family of drives which allows electronic reversal of a DC motor via a full wave eight (8) SCR bridge. The eight (8) SCR bridge allows these drives to be used directly from a 115VAC or 230VAC single phase power source without the need of a power transformer. The Quad R covers a horsepower range from ¼ to 5 HP. The Quad R is customer reconnectable for 115VAC or 230VAC input, 50 or 60 Hz input, and armature or tachometer feedback for speed regulation. The control electronics is electrically isolated from the armature, field and AC line. Each drive is shipped from the factory with a model number and serial number. Make reference to these numbers if it becomes necessary to consult the factory.

1.1 TECHNICAL DATA:

Model Number	Input Voltage	Horsepower	Armature Voltage
6150	115VAC	1/4 - 1 HP	0- 90 VDC
	230VAC	1/2 - 5 HP	0-180 VDC

Control Module Dimensions: 10 3/4" H x 9 1/2" W x 6" D

Ambient Temperature: Chassis Model 0°C-55°C (32°F to 131°F)
Enclosed Model 0°C-40° (32°F to 104°F)

AC Line Voltage Variation: +10% to -5%

AC Line Frequency: 50/60Hz, ±2Hz

Service Factor: 1.0

Acceleration Rate: Selectable

A. By Current Limit
B. Linear Adjustable .3 to 3 seconds
C. Linear Adjustable 3 to 30 seconds
D. Linear Adjustable 6 to 60 seconds

Maximum Load: 150% for one minute
200% for ten seconds

Current Limit Ranges: Selectable

A. 5 Amps Nominal
B. 7.5 Amps Nominal
C. 10 Amps Nominal
D. 15 Amps Nominal
E. 25 Amps Nominal

Forward Current Limit:	Adjustable 20-200% of Nominal Current Range
Reverse Current Limit:	Adjustable 20-200% of Nominal Current Range
Feedback Mode:	Selectable A. Armature Voltage B. Tachometer Voltage - Selectable 3 Ranges a. 7VDC/1000RPM Input b. 20.8VDC/1000RPM Input c. 50VDC/1000RPM Input
Speed Regulation:	A. Armature Voltage ±2% of Base Speed B. DC Tachometer ±1% of Base Speed
Maximum Speed:	Adjustable 70% to 110% of rated speed
Reference Input:	±10VDC
I.R. Compensation:	Adjustable
Field Supply:	Full wave or half wave
Monitoring Output:	A. Arm. Voltage Scaling 6VDC ±20% = 100% B. Arm. Current Scaling 2VDC ±10% = 100%

1.2 CONTROL FEATURES

Electrically Isolated Heatsink

Transient Protection: MOV's, Snubbers, & Line Inductor

Current transformer for isolated current feedback

Impedance isolation for armature voltage feedback

Enable circuit with LED indicator

Field Loss Circuit with LED indicator and shutdown logic

Rectifier Fusing for SCR protection

Control Fuse and Field Fuse for short circuit protection.

Accessable at Terminal Strip:

A. Current Loop Input (5V ±10% = 100% current)
B. External Fault Reset
C. Auxiliary Reference Summing Input
D. Power Supplies: Max. 100mA total for all supplies
   a. +10VDC @ 10mA max.
   b. -10VDC @ 10mA max.
   c. +15VDC @ 30mA max.
   d. -15VDC @ 30mA max.
   e. +24VDC @ 50mA max.
E. Driver output for external fault relay.
F. External Enable Input

G. Fault Module: Provides over-current and over-voltage trip circuitry. Provides 1 Form C relay contact for customer use. Relay drops out on fault. Also interfaces relay with standard field loss.

1.3 Standard Models for the Quad R Series SCR Motor Speed Controls.

Model	Description
6150	Basic control Module with Fault Module Assembly. Supplied with external speed potentiometer assembly.
6111	115VAC Chassis Assembly (¼ -1 HP) with an armature contactor and reversing logic. Offers regenerative reversing and regenerative braking operation; with emergency stop by dynamic braking.
6151	230VAC Chassis Assembly (½ - 5 HP) with an armature contactor and reversing logic. Offers regenerative reversing and regenerative braking operation; with emergency stop by dynamic braking.
6112	Model 6111 supplied in a NEMA 12 enclosure.
6152	Model 6151 supplied in a NEMA 12 enclosure.

1.4 Basic Remote Stations

Part No.	Description
6002	Emergency stop, FWD/Rev, stop push buttons and speed adjust potentiometer.

1.4.1 Optional Features

Dash No.	Description
-RJ	Run-Jog option with Run-Jog selector switch. Jog speed adjust internally located.

2.0 INSTALLATION

Follow local electrical codes to assure adequate protection for the equipment in your system. The following guidelines should also be followed to assure best performance of the Quad R in your application.

2.1 MOUNTING INSTRUCTION

All Quad R models must be mounted in an area which is free from chemical fumes, oil vapors, steam, excessive moisture and dust. The mounting location must also provide enough cooling air to prevent the drive from over heating. Chassis models are designed to operate in an ambient of 0° to 55°C (32° to 131°F). SECO/Dana supplied enclosed units are designed to allow for a 15°C rise inside the enclosure due to the power dissipation of the drive. Therefore, the maximum ambient outside an enclosed unit must not exceed 0° to 40°C (32° to 104°F). When sizing an enclosure for a chassis unit allow 150 watts maximum for the 5 HP Model.

2.2 CIRCUIT PROTECTION

The Quad R Series must have branch circuit protection per local codes. If a transformer is used, primary and secondary circuit protection should be supplied. The table below provides information for recommended transformer sizes and AC line fusing based on the motor horsepower used.

HP Range	AC Input	Transformer	AC Line Fuses
1/4-1/2HP	115VAC	1.5KVA	10 Amp, Buss TypeSC
1/2-1HP	115VAC	3.0KVA	20 Amp, Buss Type SC
1/2-1HP	230VAC	3.0KVA	10 Amp, Buss Type SC
1 1/2-2HP	230VAC	5.0KVA	20 Amp, Buss TypeSC
3HP	230VAC	7.5KVA	30 Amp, Buss Type SC
5HP	230VAC	10 KVA	50 Amp, Buss Type SC

The 6150 model is internally fused with a fast acting rectifier type fuse in order to provide protection for the power bridge SCR's in case of a short circuit on the armature terminals or in the case of a cross-fire between forward and reverse bridges. Model 6150 is fused with a Buss Type KAX60 or equivalent. The internal fuse is not to be replacement for proper branch circuit protection which should be supplied external to the basic model.

2.3 CONNECTION INSTRUCTIONS

The control electronics of the Quad R Series is isolated from the Armature, Field and AC line terminals. This allows circuit common to be referenced to ground in systems which have grounded speed reference. Care should be taken to prevent ground loops with circulating currents which can give distorted speed signals. To prevent such problems, assure that circuit common is only grounded at one location. Grounding of circuit common is not a requirement for drive operation. This capability is merely available to simplify reference interfacing. It is recommended, however, that designated ground terminals, chassis, control enclosures, and motor frames be grounded per local codes.

There are two types of wiring connections required to install the Quad R drives. The first type is the power wiring which is the AC line input, Armature output and Field output. These are the connections founded on TB3. The second type is the signal wiring which includes the speed potentiometer, tachometer, DC power supplies and all other connections for TB1 and TB2. Much care should be taken to keep the power and signal wires separated from each other and never run power and signal wires in the same conduit. In cases where signal wiring is required outside the control cabinet or in large cabinets with other equipment, shielded cable is recommended on all signal connection. Shields should be tied at either TB1-2, TB1-3, TB2-16 or TB2-22. Tie the shields at the control end only.

Refer to Connection Diagrams for proper terminal connections and follow the instructions in the next sections to assure power jumper connections for your specific application.

2.3.1 230VAC OR 115VAC OPERATION:

The Quad R models can be operated on either 230VAC or115VAC. The motor selected determines the required AC voltage input. For 180VAC armature motors, 230VAC input is required. Standard drives are shipped from the factory set-up for 230VAC operation. On the Power Section Board (Mother Board hinges open to allow access) J2 connects to J6, J3 connects to J5, J7 connects to J11 and J8 connects to J12 for 230VAC operation. To convert to 115VAC operation connect J2 to J1, connect J3 to J4, connect J7 to J9 and connect J8 to J10.

2.3.2 60HZ OR 50HZ OPERATION:

Standard drives are shipped from the factory set up for 60Hz operation. There are four (4) jumpers on the Current Regulator Board which determine the 60 Hz or 50 Hz set up. With the control oriented so that the ribbon cable connector is on the left side of the Current Regulator Board, the drive is set up for 60 Hz when each of the four (4) jumpers are on the bottom row of pins. For 50 Hz operation move each jumper from the bottom row to the top row of pins.

2.3.3 PERMANENT MAGNET OR SHUNT FIELD CONNECTIONS:

Standard drives are shipped from the factory set up for shunt field operation using the field loss sensing circuit which is a standard feature in all Quad R drives. If a permanent magnet motor is used, it is necessary to change Jumper PL1 located on the Power Section Board from the SH (shunt) to the PM (permanent magnet) position. Failure to move the jumper when using a permanent magnet motor will give a field loss failure indication and prevent operation of the drive.

2.3.4 ARMATURE OR TACHOMETER FEEDBACK OPERATION:

Standard drives are shipped from the factory set up for Armature Feedback Operation. For Armature Feedback two jumpers on the Velocity Loop Board are involved. The Tach/ARM Jumper is placed in the ARM position. The IR/$\overline{IR}$ Jumper is placed in the IR position to provide IR compensation. If a motor tachometer is to be used for feedback, move the Tach/ARM Jumper to the Tach position, move the IR/$\overline{IR}$ Jumper to the $\overline{IR}$ position and select either 7VDC, 20.8VDC, or 50VDC position on the Tach Range Jumper also located on the Velocity Loop Board. The Tach range used is based on the volts/1000RMP rating of the tachometer to be used.

2.3.5 CURRENT RANGE CONNECTIONS:

Standard drives are shipped from the factory with the 5 AMP range selected with Current Limit set for 150% of the nominal range. The Current Range is determined by the Current Jumpers on the Power Supply Board. There are 5 ranges which can be used on Model 6150. Use the following table to select the proper current range based on the model number, output armature voltage and motor horsepower.

Jumper Position	**Horsepower for Model RC1005**
5 AMPS (A)	1/4-1/2HP at 90VDC 1/2-1HP at 180 VDC
7.5 AMP (B)	3/4HP at 90 VDC 1 1/2HP at 180 VDC
10 AMP (C)	1 HP at 90 VDC 2 HP at 180 VDC
15 AMP (D)	3 HP at 180 VDC
25 AMP (E)	5 HP at 180 VDC

The current range selected sets the 100% current level with a maximum 200% of the current range available for intermittent duty.

2.3.6 ACCELERATION RANGE CONNECTIONS

Linear Acceleration for Forward and Reverse is a Standard Feature of the Quad R Series. There are three (3) linear ranges available by selecting the proper jumper position on the Velocity Loop Board. The ranges are 0.3 to 3 seconds, 3 to 30 seconds; 6 to 60 seconds. If linear acceleration is not fast enough the circuit can be bypassed by moving a second jumper to the AC/DC position. In this mode, accel and decel are by current limit only. Standard drives are shipped with the AC/DC position selected and the 0.3 to 3 seconds range selected.

3.0 DESCRIPTION OF CONTROLS

3.1 VELOCITY LOOP BOARD POTENTIOMETERS

3.1.1 MAX SPEED

This potentiometer provides a means to adjust the highest motor shaft speed when the speed potentiometer is set to maximum. Clockwise rotation of this adjustment increases the speed.

NOTE: Do not exceed rated armature volts for the motor.

3.1.2 FORWARD AND REVERSE CURRENT LIMIT

These adjustments limit the maximum amount of armature current supplied to the motor. Clockwise adjustment of these pots will increase armature current (factory set for 150% of motor current).

3.1.3 I.R. COMP

This adjustment provides a voltage signal proportional to armature current to boost the armature voltage when the motor is loaded to compensate for the motor losses. The potentiometer should only be used when operating in armature feedback. The IR/$\overline{IR}$ jumper on the velocity loop board enables or disables this potentiometer for use in armature feedback and the $\overline{IR}$ disables the potentiometer for tachometer feedback.

Clockwise rotation of this adjustment provides an increase in armature voltage as armature current increases. If the adjustment is too low the speed will decrease with increasing load. If the adjustment is too high the speed will increase with load or the drive may become unstable.

3.1.4 FORWARD AND REVERSE ACCEL

Clockwise rotation of these adjustments will increase the time of acceleration and deceleration. When operating in the forward directions, the reverse accel adjustment acts as a deceleration pot. When operating in the reverse direction the forward acceleration adjustment acts as a deceleration pot. Three ranges are selectable by a jumper on the velocity loop board or the circuit may be bypassed by placing the AC/DC or $\overline{AC/DC}$ jumper in the $\overline{AC/DC}$ position.

3.1.5 STABILITY

This adjustment controls the rate of change for the velocity loop. Clockwise rotation gives the fastest rate of change and is the normal setting when system inertia does not exceed the inertia of the motor. Less responsive performance as required by high inertia systems may require counter clockwise rotation of this adjustment.

3.1.6 OFFSET

This adjustment is used to null offset voltages in the velocity loop amplifiers when the reference voltage input is zero.

3.1.7 DEADBAND

This adjustment provides a means to prevent motor creeping due to the high gain in the velocity and current loops. Clockwise rotation increases the deadband. With full clockwise rotation on this potentiometer, it may take +.5VDC input before the SCRs will begin to fire.

3.2 POWER SUPPLY BOARD POTENTIOMETER

3.2.1 CURRENT CALIBRATE (R34)

This adjustment is used to calibrate the current feedback signal so that 5 volts from the velocity loop commands 100% current for the current range selected. With a 5 volt current reference, clockwise rotation increases the output motor current.

3.3 CURRENT REGULATOR POTENTIOMETERS

3.3.1 GAIN

This adjustment controls the gain of the current loop. Clockwise rotation of this adjustment increases the current loop gain and gives the fastest rate of change between forward and reverse. Typical settings are between 70% and 100% of full clockwise.

3.3.2 RESPONSE

This adjustment controls the bias input for the forward and reverse trigger circuits. Counter clockwise rotation of this pot increases the trigger bias and causes the drive to be more responsive to transitions between forward and reverse.

NOTE: Rotation on the response pot changed 5-2-83.

3.4 FAULT MODULE POTENTIOMETER

3.4.1 OVERSPEED

This adjustment is located on the fault module. This provides an adjustable overspeed trip in case of motor runaway. Decrease this adjustment counter clockwise to lower trip point level.

3.5 STANDARD LED INDICATORS - Located on Velocity Loop Board

Enable Led (CR11) - Indicates drive is ready to run.

Field Loss Led (CR12) - Indicates a fault in the field supply.

3.6 FAULT LED INDICATORS - Located on the Mother Board.

Overcurrent Led - Indicates an overload condition.

Overspeed Led - Indicates a runaway condition.

4.0 START-UP PROCEDURE

Before applying A.C. power the following checks should be made:

1) Check all connections that have been made. Be certain they agree with the connection diagram.
2) Check to see if the control has been setup for the proper input voltage. Refer to Section 2.3.1 and 2.3.2.
3) Check motor and motor ratings to see if the control is set up properly to run this motor. Refer to Sections 2.3.3, 2.3.4, and 2.3.5.

4.1 ADJUSTMENT PROCEDURE

1) Set the speed adjust pot to zero. Apply A.C. power and enable the control. The Enable Led on the Velocity Loop board should light. If the Enable Led fails to light, refer to the trouble shooting section of this manual.

2) Increase speed adjust to max. and adjust Max. Speed pot on the Velocity Loop board to the base speed of the motor, usually 1750RPM.

3) Turn the speed adjust pot to zero and motor should stop. If motor is creeping, increase the Deadband pot on the Velocity Loop board clockwise to eliminate creeping.

4) Select the desired accel range on the Velocity Loop board (Refer to Section 2.3.6). The Forward and Reverse Accel pots are used to change the accel rate of the motor from zero speed to set speed. Clockwise adjustment increases the accel time.

5) The Current Limit pots are factory adjusted for 150%. If re-adjustment is necessary for your application, turn the current limit pots to approximately 25%. Turn the speed adjust pot to zero and fully load the motor. Carefully turn speed adjust pot up and monitor the armature current; adjust the Current Limit pot to the desired percent of rated motor current, depending on your application.

6) The IR Comp adjustment provides a means to adjust armature current feedback to compensate for motor losses and to obtain flat load regulation. The actual IR Comp adjustment is made as follows: with no load on the motor, apply power to the control and slowly increase the speed pot to 900RPM. Apply full load to the motor, if the motor speed drops, increase the IR Comp pot clockwise until the unloaded motor speed is obtained.

   NOTE: In Tach Feedback mode the IR Comp is not required and the $\overline{IR}$ Jumper should be selected.

5.0 CURRENT CONTROL OPERATION

The current control operates similar to the motor speed control except that the current is controlled instead of the voltage. This type of control is, therefore, an adjustable torque control and can be used for any application where a constant torque is desired. The current can be adjusted by means of a potentiometer or a process control signal.

This type of system is intended to maintain a constant motor torque and will change speed as the load changes. Because of this, a problem can result if the load drops too low--the motor will over speed and possibly cause damage. This problem can be corrected by the use of an over speed trip circuit to shut the control down if this occurs. The fault module provides an adjustable overspeed trip point and form C contacts for an indication of fault or overspeed.

Operating the control in the torque or current loop mode is accomplished by removing the terminal strip jumper between TB1-10 and TB1-11, and applying the torque reference signal to TB1-10. The torque applied to the motor will be in direct proportion to the reference signal applied at TB1-10.

When using the control in the current loop mode, all ratings of the control and motor must be observed. (See specifications)

6.0 TROUBLE SHOOTING PROCEDURE

Fast, accurate, and complete repair is always preceded by a complete analysis of the problem. Read the trouble shooting procedure before attempting to repair the control. SECO drives have been factory tested before shipping. The problems that occur can be defined in two categories - start up problems and problems that occur after the control has been operational for some time.

Start up problems encountered are usually the result of improper interconnection wiring, handling damage, or load problems. Carefully recheck all interconnection wiring if difficulty is encountered on start up. If this is not the problem, check for any apparent physical damage before proceeding to the trouble shooting charts.

CAUTION: Turn off AC power before touching or removing parts from this control.

VOLTAGE READINGS: The following voltages readings are normal operating voltage readings as measured with Simpson VOM Model 260 or equivalent.

WARNING: HIGH VOLTAGES TO GROUND ARE PRESENT IN THE SECO CONTROL, REGARDLESS OF WHETHER THE A.C. SUPPLY IS GROUNDED OR NOT. TO PROTECT THE OPERATOR FROM ELECTRICAL SHOCK AND POSSIBLE FATAL CONSEQUENCES, THE FOLLOWING PRECAUTIONS MUST BE TAKEN:

A. Operator must not be in contact with a grounded surface when working on the control. Stand on an insulated surface.

B. The motor armature brushes and field supply are electrically "HOT". Before working on the motor, all A.C. power must be disconnected from the control.

C. When a test instrument is being used, care must be taken to insure that its chassis is not grounded either by a grounding plug connections or by being in contact with a grounded surface. Extreme care must be taken when using the oscilloscope since its chassis will be electrically "HOT" to ground when connected to the control system.

D. No part of the control should be grounded, except with the approval of SECO Electronics.

5.1 TYPICAL VOLTAGE READINGS

115 V Units

Terminal No.	Function	Voltage
Power Term 6 and 7	AC Input -5 + 10% Voltage	109VAC to 126VAC
Power Term 2(-) and 3 (+)	Field Voltage	85VDC to 110VDC
Power Term 4 and 5	Armature Voltage	0 to ±90VDC

230 V Units

Terminal No.	Function	Voltage
Power Term 6 and 7	AC Input -5 + 10% Voltage	218VAC to 253VAC
Power Term 2 (-) and 3 (+)	Field Voltage	190VDC to 220VDC
Power Term 4 and 5	Armature Voltage	0 to ±180VDC

Control Circuit Voltages 115/230V Units

Terminal No.	Function	Voltage
TB2-16 (-) TB2-21 (+)	+24V Unregulated	23.8VDC to 27VDC
TB2-16 (-) TB2-20 (+)	+15V Regulated	14VDC to 16VDC
TB2-16 (+) TB2-19 (-)	-15V Regulated	-14VDC to -16VDC
TB2-16 (-) TB2-17 (+)	+10V Regulated Speed Reference	9.5VDC to 10.5VDC
TB2-16 (+) TB2-18 (-)	-10V Regulated Speed Reference	-9.5VDC to -10.5VDC
TB1-3 (-) TB1-6 (±)	Voltage Feedback Reading Proportional to Motor Speed	0 to ±6V for 0 to ± Maximum Speed
TB1-3 (-) TB1-12 (±)	Current Feedback Based on Motor Current in Percent	0 to ±2.0V for 100% 0 to 3.6V for 200%
TB1-3 (-) TB1-4 (±)	Speed Reference Input	0 to ±10VDC
TB1-3 (-) TB1-10 (±)	Current Reference Input Based on 5V = 100% Current 10V = 200% Current	0 to ±5V for 100% 0 to ±10V for 200%

5.2 OPERATIONAL CHECK LIST

A. Control will not run:

1. Check AC input to drive through line fuse F1 on the power component board.
2. **Field Loss**
   Blown fuse F2 on power component board.
   Bad Field Supply
   No field connected (open circuit to motor)
3. **Enable Led fails to light**
   No enable signal (+15V) at TB1-7
   Bad power supply
   Defective T6 transformer
   Blown fuse F3 on power component board.
   Defective Led
4. **Overspeed Trip**
   Overspeed pot setting too low.
   Loss of feedback - Check voltage feedback and tach feedback at TB1-6 and TB1-1.
   Tach Reversed
5. **Overcurrent Trip**
   Motor overloaded - Armature current exceeds 100%
   Defective component on printed circuit boards.
   Defective SCR.

B. Control Blows Fuses:

1. Incorrect wiring of control, motor or isolation transformer. Recheck all wiring.
2. Defective component on Control Board - Remove connectors 1, 2, and 3 power component board. Reapply power. If control no longer blows fuses, check control cards and settings. If fuses continues to blow, the power section is defective.
3. Defective Component on power component board.
4. Defective SCR - Check for short.
5. Defective Isolation Transformer - Check transformer voltage.
6. Defective motor.

C. Motor will not reach desired operating speed:

1. Motor overload - Check load current.
2. Max. speed improperly set.
3. Torque adjust set too low.
4. Defective component on P.C. boards.
5. Defective SCR.
6. Defective isolation transformer.
7. Response pot set too low - Turn counter clockwise to increase response.

D. Motor Speed is Unstable:

1. IR Comp set too high (turn CCW to decrease) - turn to zero if operating in Tach Feedback Mode and jumper $\overline{IR}$ position on the Velocity Loop board.
2. Gain and Stability not set correctly - Adjust for smooth operation.
3. Defective Component on P.C. boards.

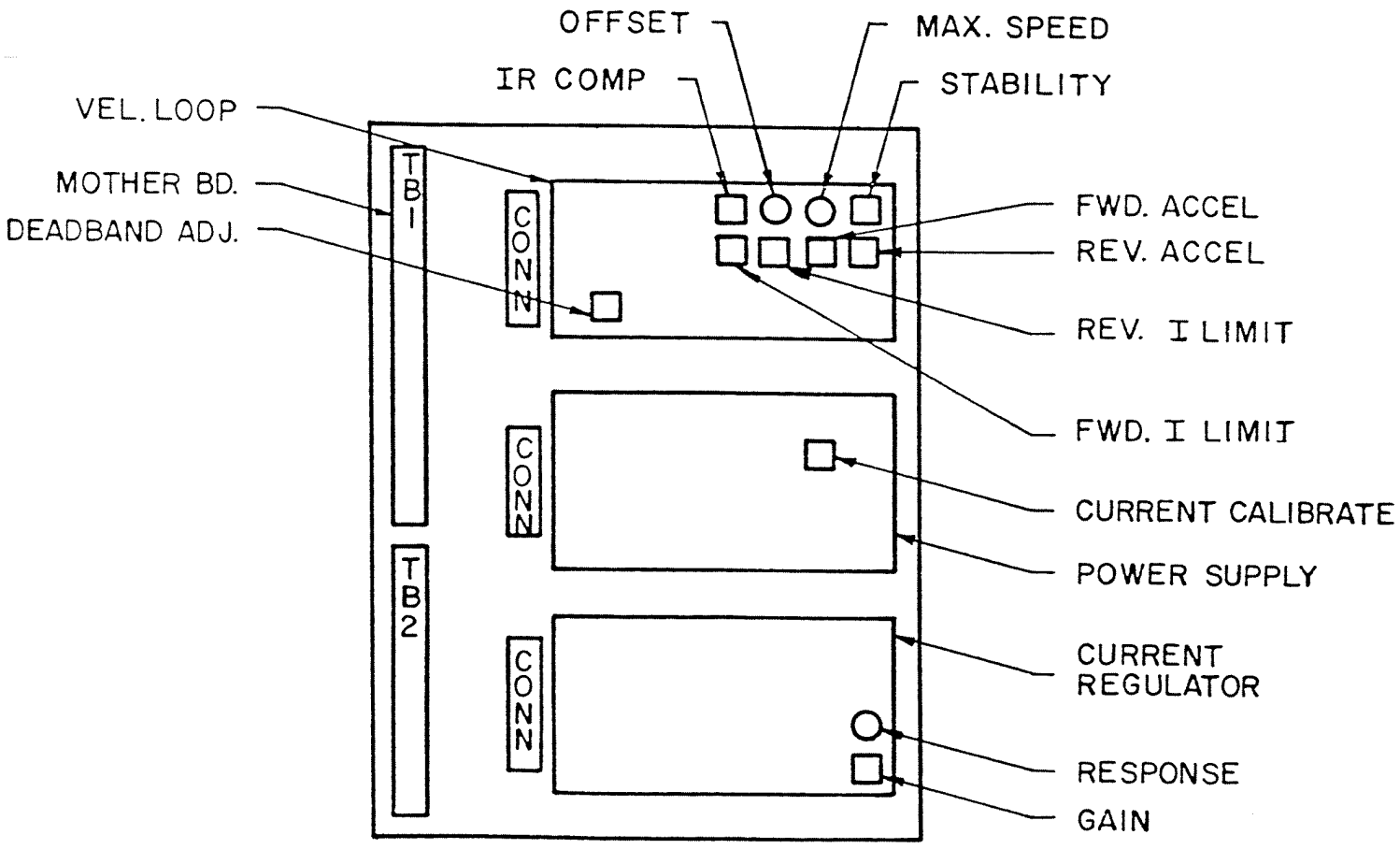
E. Motor speed drifts or changes abruptly:

1. Defective component on printed circuit boards.
2. Defective tachometer.
3. Defective SCR.
4. Defective motor.

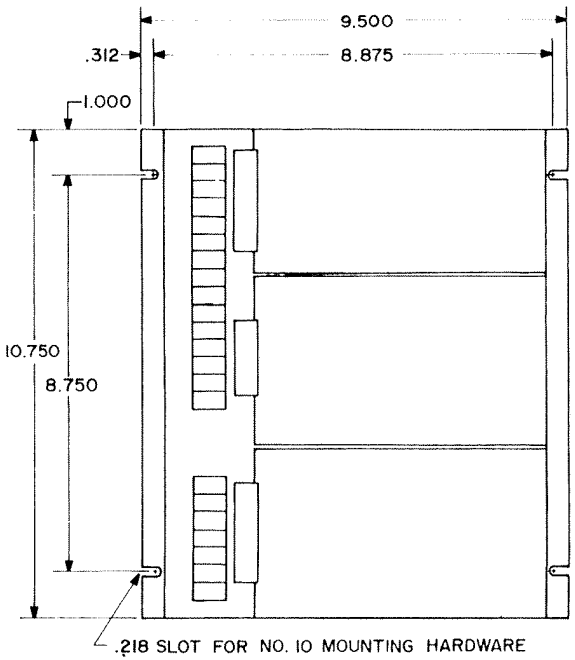
F. No output from control:

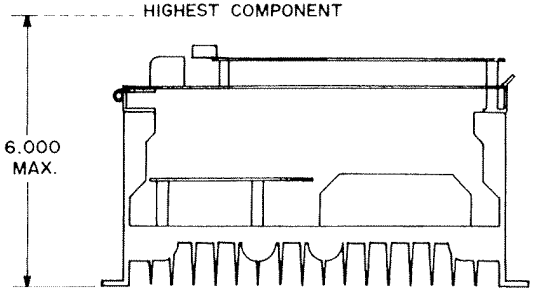
1. Blown fuse or fuses.
2. Defective component on printed circuit boards.
3. Defective isolation transformer - Check transformer voltage.
4. Incorrect Wiring - Recheck all wiring.

5.3 POT IDENTIFICATION



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED





WEIGHT: 13 LBS 8 OZ

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MAT'L	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 3 PLACE DECIMALS ±
		FINISH	DRAWN BY HJH DATE 5-4-83; CHECKED BY DWH 5-4-83; APPROVED BY
NEXT ASSY.	USED ON		
APPLICATION			

SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

TITLE QUAD R MOUNTING DIMENSIONS

SIZE C | DRAWING NO. C35406

SCALE —— | SHT 1 OF 1

REVISIONS				
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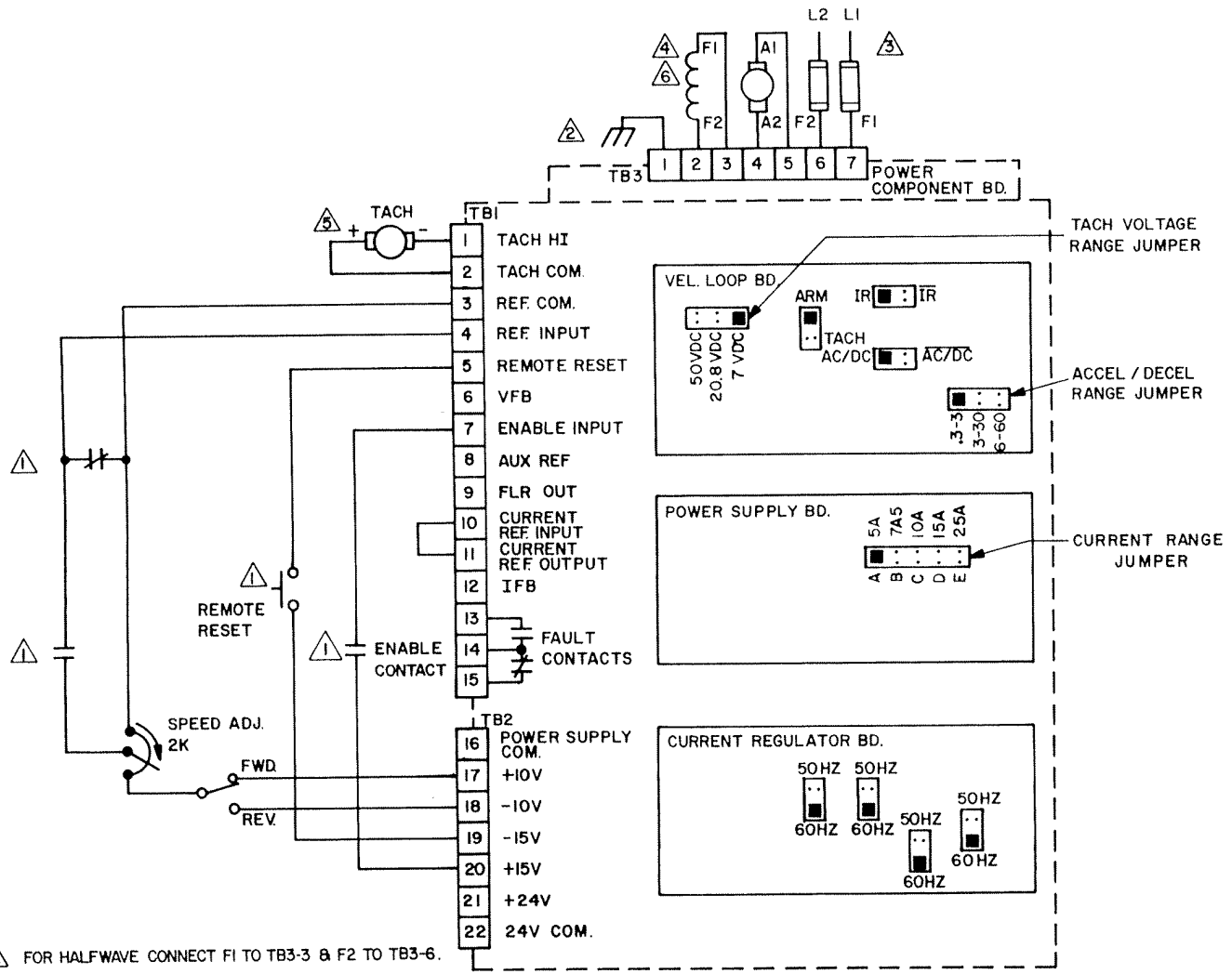
	B	REDRAWN	8-22-83	



6. FOR HALFWAVE CONNECT F1 TO TB3-3 & F2 TO TB3-6.
5. POLARITY SHOWN IS WITH A POSITIVE REF. INPUT.
4. FOR PERMANENT MAGNET MOTORS, CHANGE JUMPER PL1 ON POWER COMPONENT BOARD FROM SH(SHUNT) POSITION TO PM POSITION.
3. SET JUMPER ON POWER COMPONENT BOARD AS FOLLOWS:
   FOR 115VAC OPERATION, JUMPER J2 TO J1, J3 TO J4, J8 TO J10 AND J7 TO J9.
   FOR 230VAC OPERATION, JUMPER J2 TO J6, J3 TO J5, J8 TO J12 AND J7 TO J11.
2. TERMINAL STRIP TB3 UNDERNEATH POWER COMPONENT BOARD.
1. CUSTOMER SUPPLIED CONTACTS.

NOTES:

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MAT'L	
		FINISH	
NEXT ASSY. / USED ON			
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ± FRACTIONS 2 ANGLES 1 3 PLACE DECIMALS ±

DRAWN BY DTB 8-16-82
CHECKED BY D.W.H 8-19-82
APPROVED BY

SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

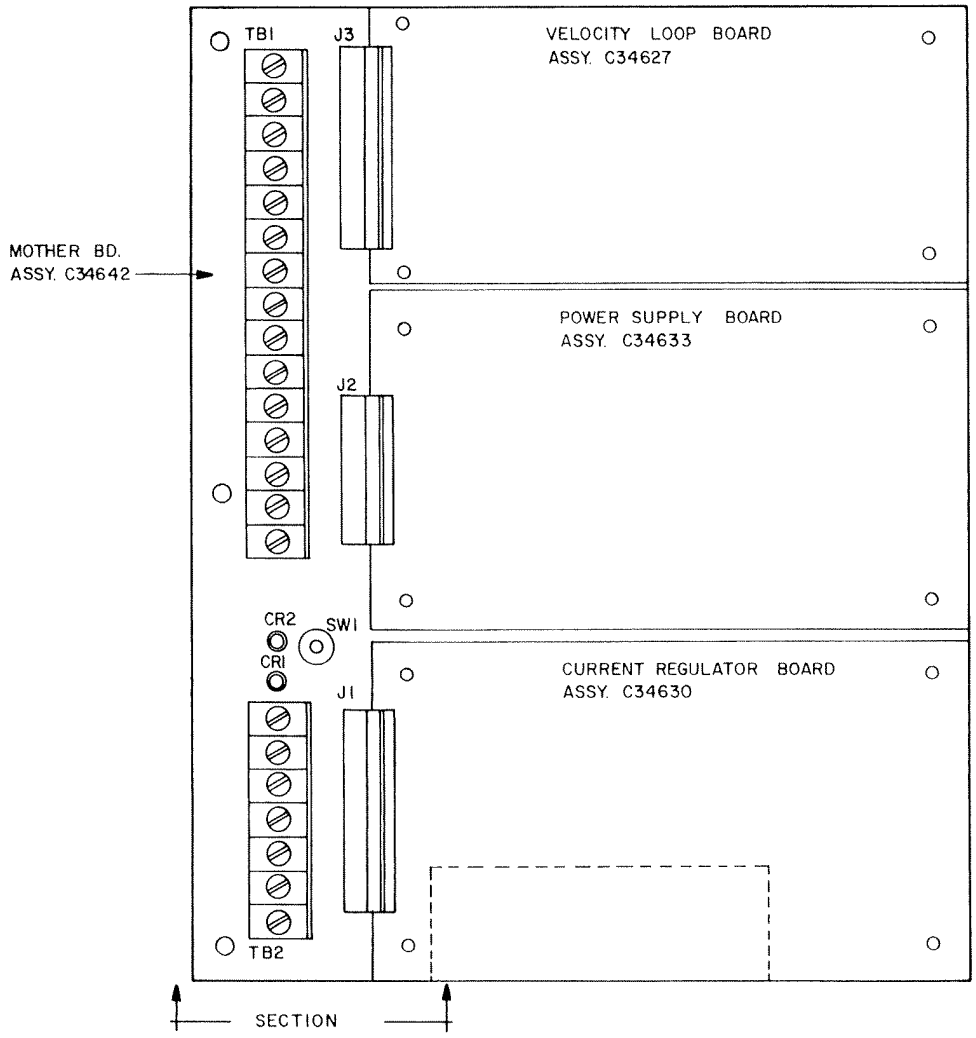
TITLE
QUAD R
CONNECTION DIAGRAM

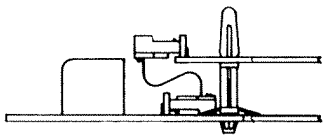
SIZE C | DRAWING NO. C35146

SCALE | SHEET 1 OF 1

18

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1235	4-26-84	DWH
	B	ECO 1288	9-7-84	DWH





SECTION

FOR BILL OF MATERIAL SEE A35262

NOTES:

1. REF. QUAD R FINAL ASSY. D35605.

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			

MAT'L

FINISH

NEXT ASSY. | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONS ±
ANGLES ±
3 PLACE DECIMALS ±

DRAWN BY SDC DATE 10-28-82

CHECKED BY DWH

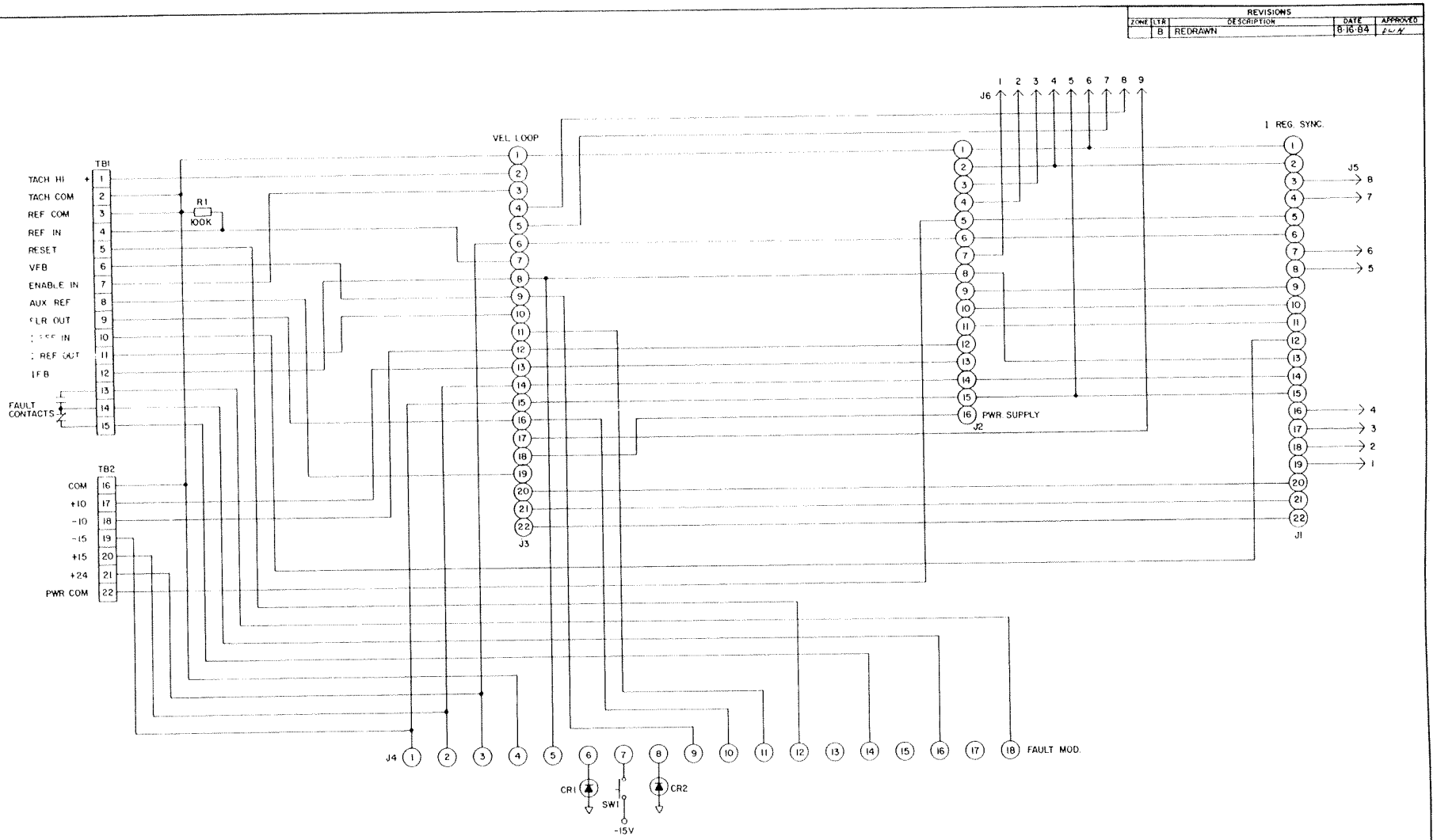
APPROVED BY

SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

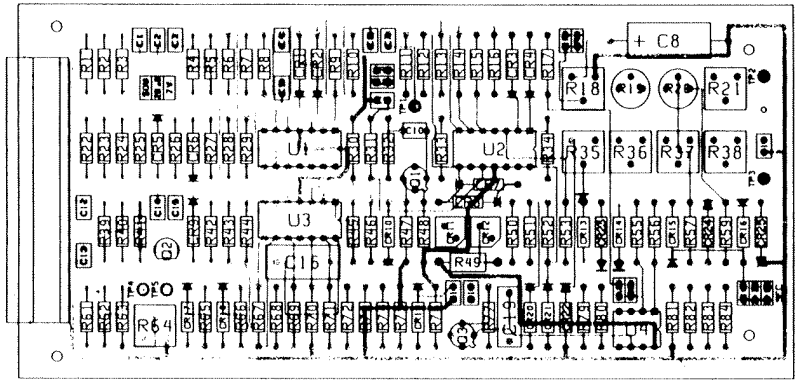
TITLE
MOTHER BOARD FINAL ASSEMBLY
QUAD R

SIZE C | DRAWING NO. C35262

SCALE NTS | SHT 1 OF 1


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
B | REDRAWN | 8-16-84
TB1
TACH HI
TACH COM
REF COM
REF IN
RESET
VFB
ENABLE IN
AUX REF
CLR OUT
SEC IN
REF OUT
LFB
FAULT CONTACTS
R1
100K
TB2
COM
+10
-10
-15
+15
+24
PWR COM
VEL LOOP
J3
J6
J2
PWR SUPPLY
1 REG. SYNC.
J1
J5
J4
FAULT MOD.
CR1
SW1
-15V
CR2
QUANTITY PER ASSEMBLY
ASSEMBLY DASH NUMBER
ITEM
PART NUMBER
DESCRIPTION
MATL
FINISH
NEXT ASSY
USED ON
APPLICATION
SECO
A DIVISION OF DANA CORP
LANCASTER, S C , U.S.A
TITLE
SCHEMATIC MOTHERBOARD
QUAD R
DRAWN BY N.J.H
DATE 8-16-84
CHECKED BY
APPROVED BY
SIZE D
DRAWING NO D35138
SCALE
SHEET 1 OF 1
THIS DRAWING CONTAINS INFORMATION PROPRIETARY TO SECO DANA. ANY REPRODUCTIONS, DISCLOSURE OR USE OF THIS DRAWING IS EXPRESSLY PROHIBITED EXCEPT AS SECO DANA MAY AGREE TO IN WRITING

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1056A	12-20-82	
	B	ECO 1112	5-13-83	DJF
	C	ECO 1121		
	D	ECO 1179	11-16-83	DWH
	E	ECO 1223	2-22-84	DWH
	F	ECO 1243	5-15-84	DWH
	G	ECO1380	10-16-85	DWH
	H	ECO 1399	4-2-86	DWH



REF. SEE A34627 FOR BILL OF MATERIALS.

1. REF. SCHEM. D35144.

NOTES:

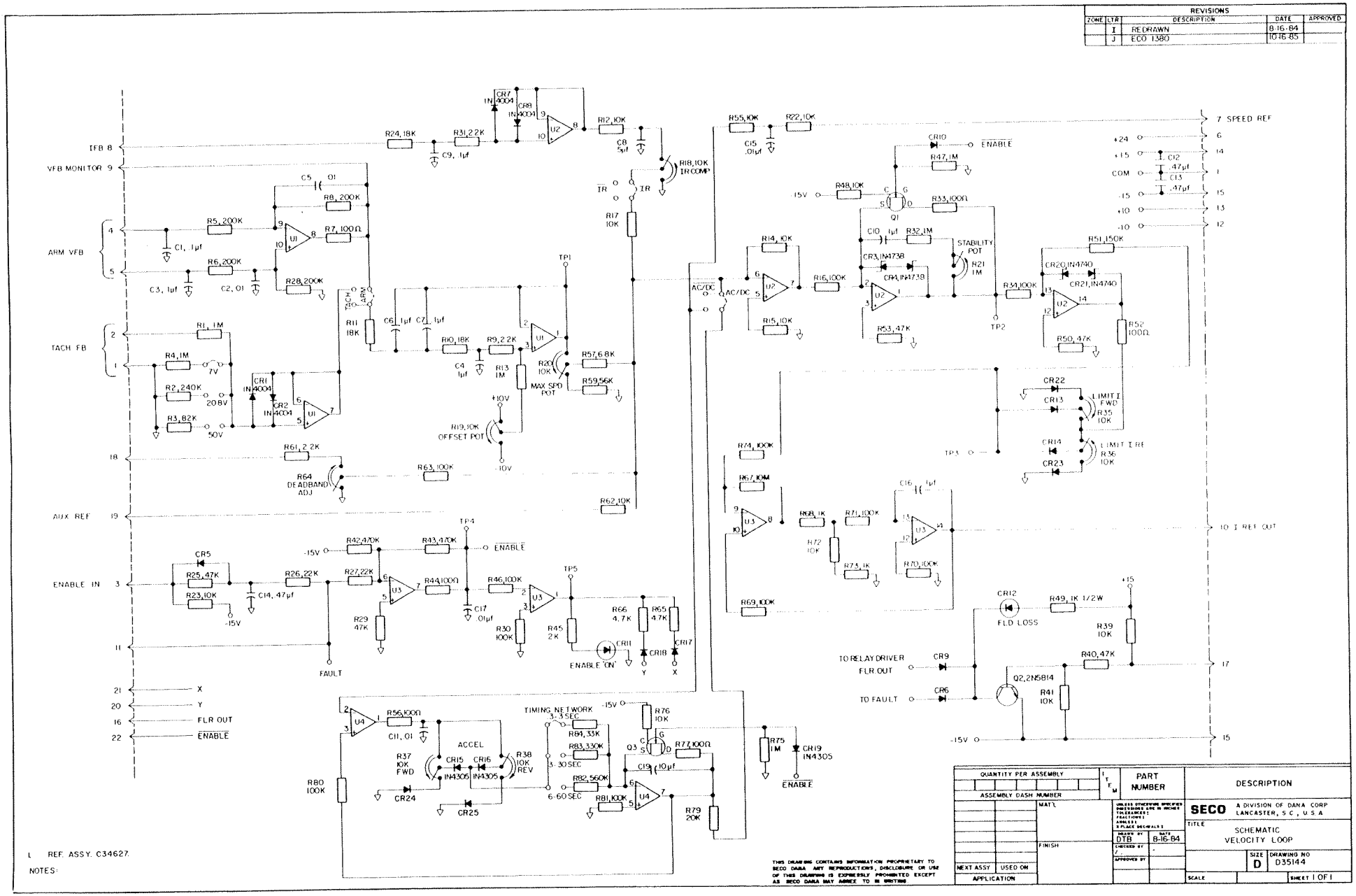
QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
MATL.			BECO A DIVISION OF DANA CORP. LANCASTER, S C., U.S.A.
FINISH			TITLE QUAD R VELOCITY LOOP BD. ASSY.
NEXT ASSY / USED ON			SIZE C — DRAWING NO. C34627
APPLICATION			SCALE NONE — SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±

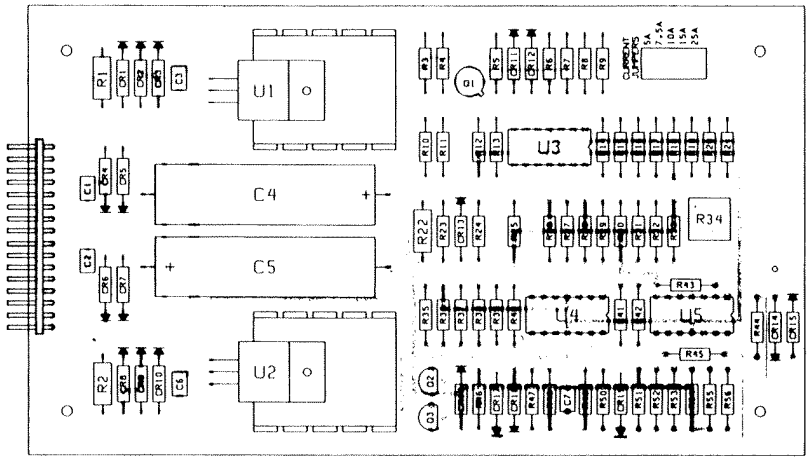
DRAWN BY DTB DATE 11-1-82

CHECKED BY DWH DATE 11-1-82

APPROVED BY


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVED
I REDRAWN 8-16-84
J ECO 1380 10-16-85
IFB 8
VFB MONITOR 9
ARM VFB
TACH FB
AUX REF 19
ENABLE IN 3
FAULT
X
Y
FLR OUT
ENABLE
7 SPEED REF
+24
+15
COM
-15
+10
-10
10 I REF OUT
TO RELAY DRIVER FLR OUT
TO FAULT
FLD LOSS
ENABLE
TIMING NETWORK 3-3 SEC
3-30 SEC
6-60 SEC
ACCEL
DECEL
MAX SPD POT
OFFSET POT
DEADBAND ADJ
STABILITY POT
LIMIT FWD
LIMIT REV
IR COMP
TACH ARM
AC/DC
ENABLE 'ON'
L REF. ASSY. 034627
NOTES:
THIS DRAWING CONTAINS INFORMATION PROPRIETARY TO SECO DANA ANY REPRODUCTIONS, DISCLOSURE OR USE OF THIS DRAWING IS EXPRESSLY PROHIBITED EXCEPT AS SECO DANA MAY AGREE TO IN WRITING
QUANTITY PER ASSEMBLY
ASSEMBLY DASH NUMBER
NEXT ASSY
USED ON
APPLICATION
ITEM
PART NUMBER
DESCRIPTION
MATL
FINISH
SECO A DIVISION OF DANA CORP LANCASTER, S C, U S A
TITLE
SCHEMATIC VELOCITY LOOP
DRAWN BY DTB
DATE 8-16-84
APPROVED BY
SIZE D
DRAWING NO D35144
SCALE
SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1112	5-13-83	
	B	ECO 1120		
	C	ECO 1209	2-7-84	



REF. SEE A34633 FOR BILL OF MATERIALS.

NOTES:

1. REF. SCHEM. C35143.

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			

MAT'L

FINISH

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±

DRAWN BY DTB | DATE 11-1-82

CHECKED BY

APPROVED BY

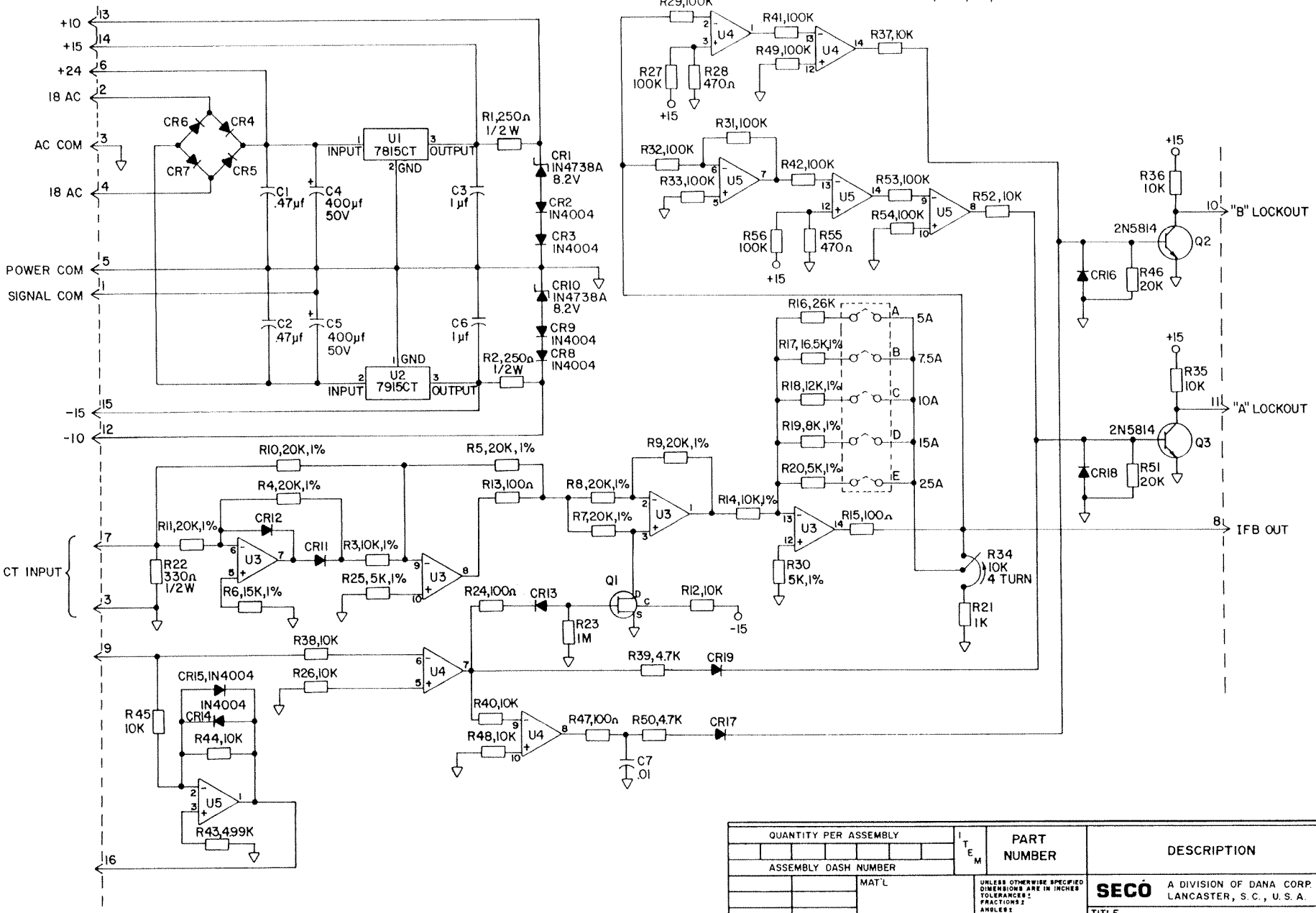
SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

TITLE: QUAD R IF & POWER SUPPLY BOARD ASSY.

SIZE C | DRAWING NO C34633

SCALE NONE | SHEET 1 OF 1

REVISIONS			
ZONE	LTR	DESCRIPTION	APPROVED
	D	REDRAWN	8-1, DWH



1. REF. ASSY. C34633.

NOTES:

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			

MAT'L

FINISH

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ± FRACTIONS ± ANGLES ± 3 PLACE DECIMALS ±

DRAWN BY	DATE
HJH	8-17-84
CHECKED BY	
APPROVED BY	

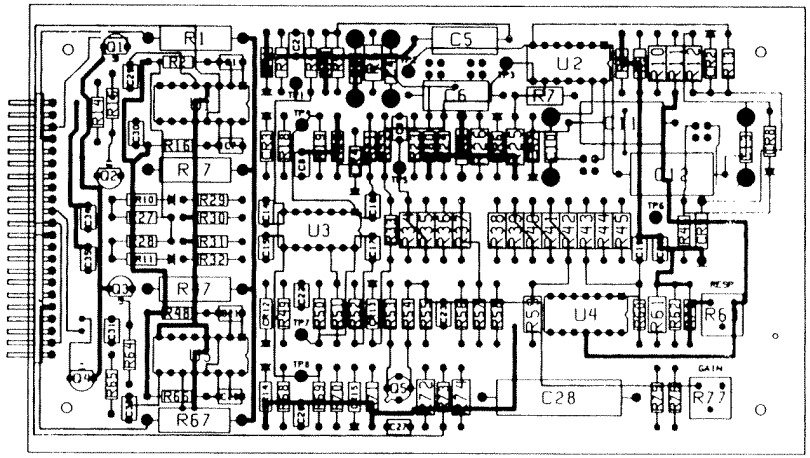
SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

TITLE
SCHEMATIC POWER SUPPLY / IFB QUAD R

SIZE C | DRAWING NO. C35143

SCALE ——— | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

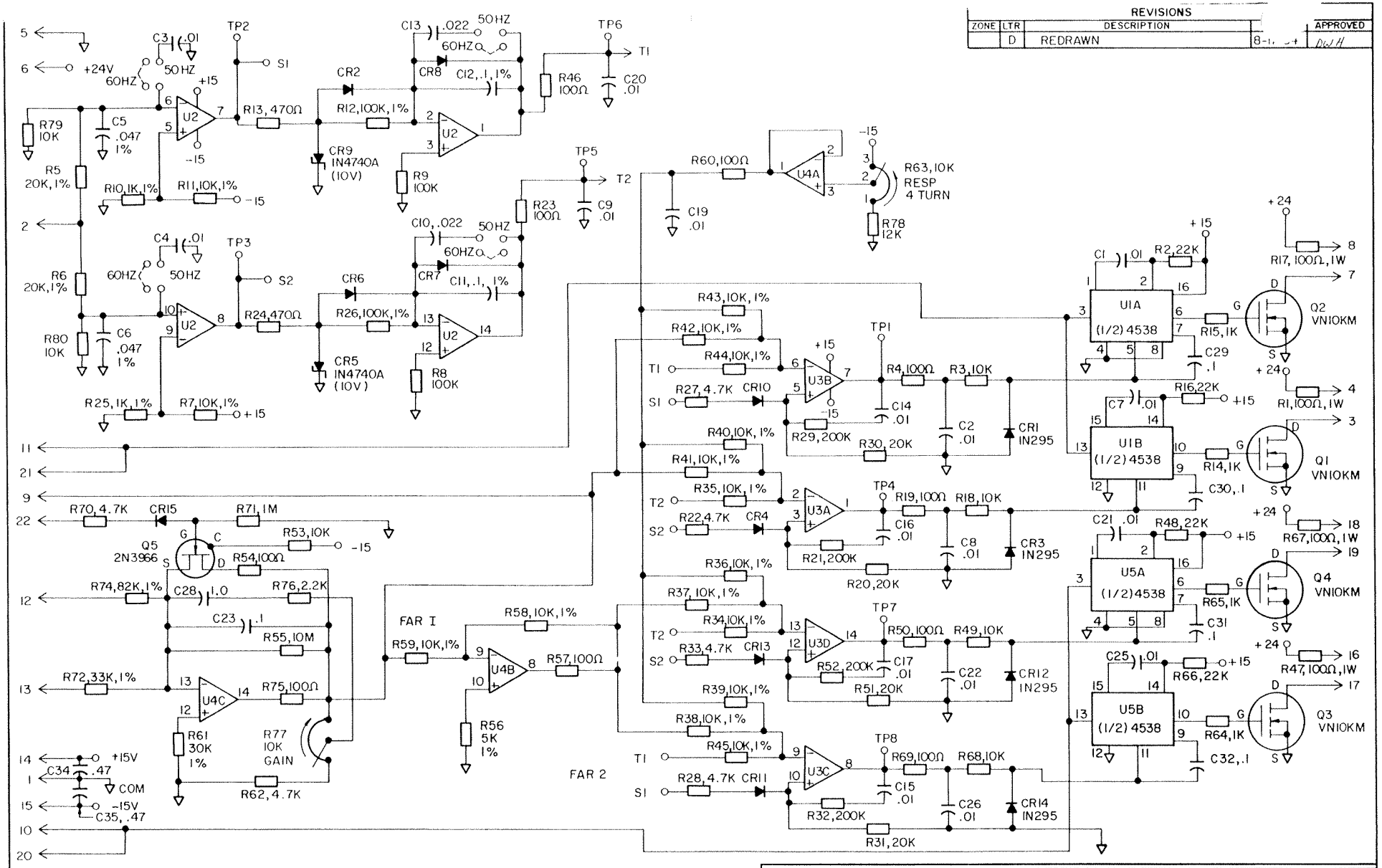


REF. SEE A34630 FOR BILL OF MATERIALS

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
	MATL	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±	SECO A DIVISION OF DANA CORP LANCASTER, S C , U S A
	FINISH	DRAWN BY DTB DATE 11-1-82	TITLE QUAD R CURRENT REGULATOR BOARD ASSEMBLY
		CHECKED BY	SIZE C DRAWING NO C34630
NEXT ASSY USED ON		APPROVED BY	SCALE NONE SHEET 1 OF 1
APPLICATION			

NOTES:

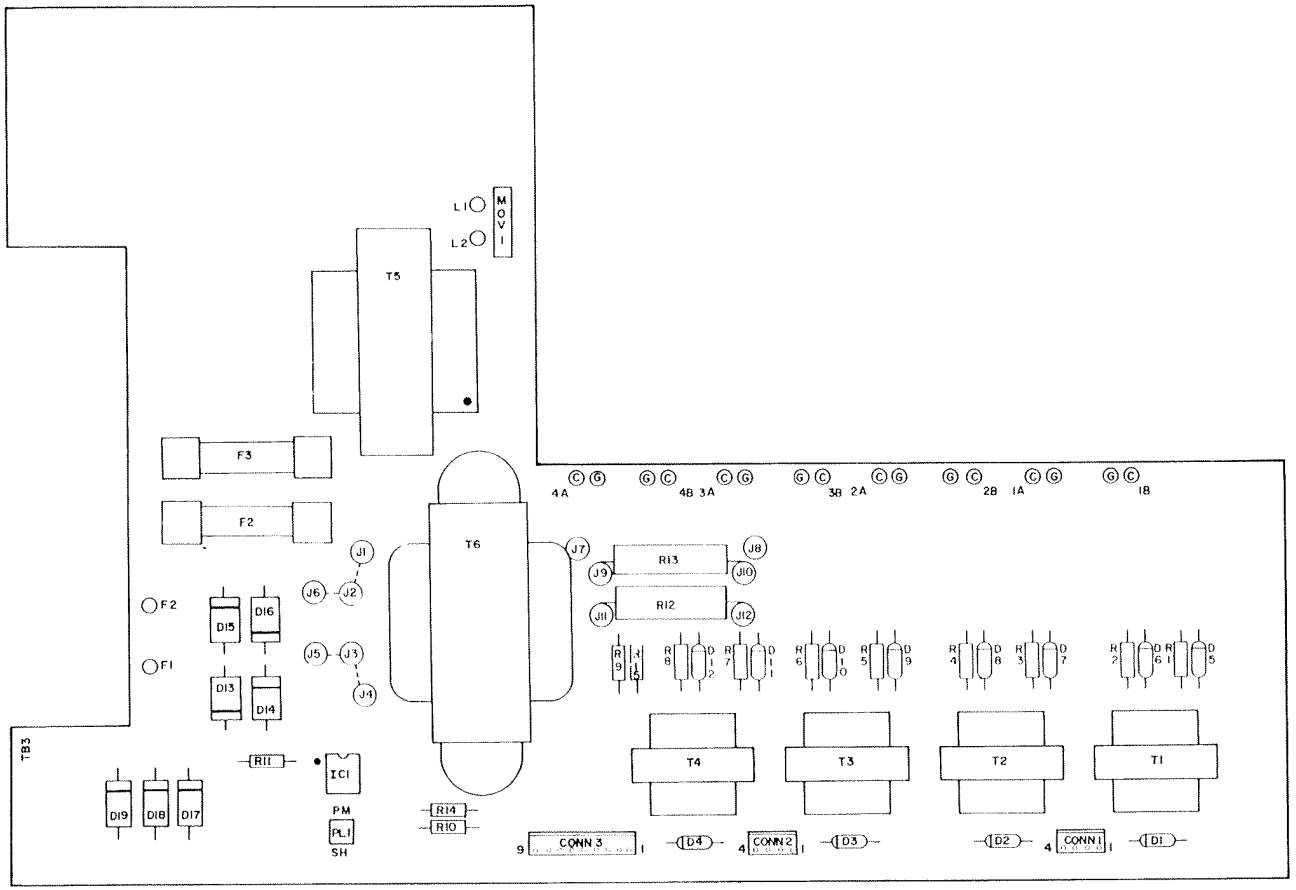
1. REF. SCHEM. C35184.



NOTES:

1. REF. ASSY. C34630.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1061	12-30-82	
	B	ECO 1131	6-30-83	
	C	ADD POLARITY MARKING: T5, CONN 1,2,3	8-5-83	
	D	ECO 1186	1-13-84	
	E	ECO 1393		
	F	ECO 1401	4-2-86	

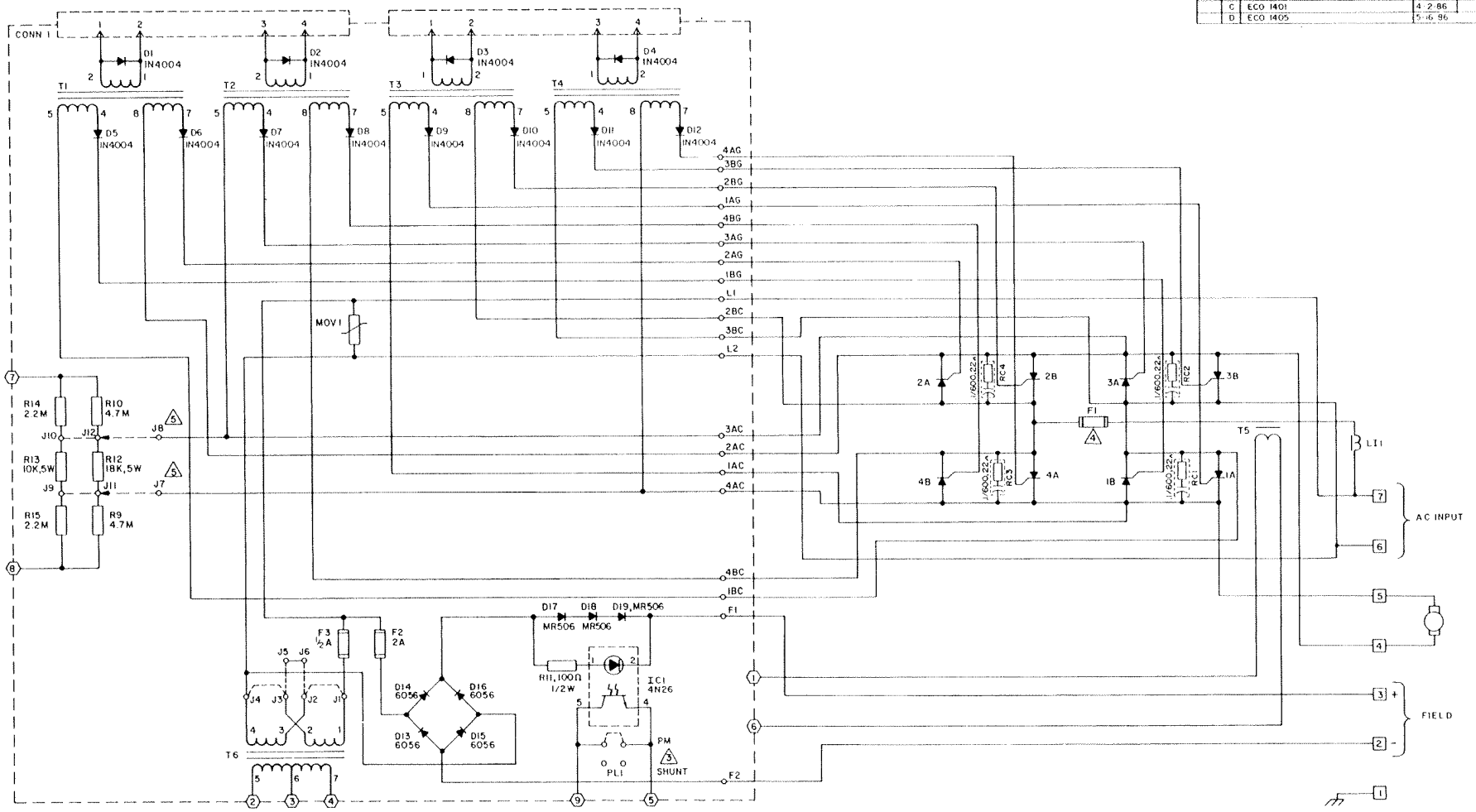


SEE REF A34639 FOR BILL OF MATERIALS.

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MATL	SECO A DIVISION OF DANA CORP LANCASTER, S C, U S A
			TITLE POWER COMPONENT BOARD 1/4 X 5HP QUAD R
		FINISH	DRAWN BY DTB DATE 11-10-81
			CHECKED BY
NEXT ASSY	USED ON		APPROVED BY
APPLICATION			SIZE D DRAWING NO D34639
			SCALE SHEET

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1142	7-29-83	
	B	ECO 1393		
	C	ECO 1401	4-2-86	
	D	ECO 1405	5-6-86	



7. FOR HALFWAVE CONNECT F1 TO TB3-3 & F2 TO TB3-6.
6. REF. ASSY. D34639.
5. FOR 115V OPERATION JUMPER J2 TO J1 & J3 TO J4, J8 TO J10 & J7 TO J9.
   FOR 230V OPERATION JUMPER J2 TO J6 & J3 TO J5, J8 TO J12 & J7 TO J11.
4. F1 IS KAX 60 ON MODEL 6150.
3. JUMPER IN PM POSITION FOR PM MOTOR & SH POSITION FOR SHUNT.
2. ⬡ DENOTES CONN 3
1. ☐ DENOTES TB3.

NOTES:

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
MATL			
FINISH			
NEXT ASSY / USED ON			
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 3 PLACE DECIMALS ±

DRAWN BY DTB DATE 12-17-82
CHECKED BY
APPROVED BY

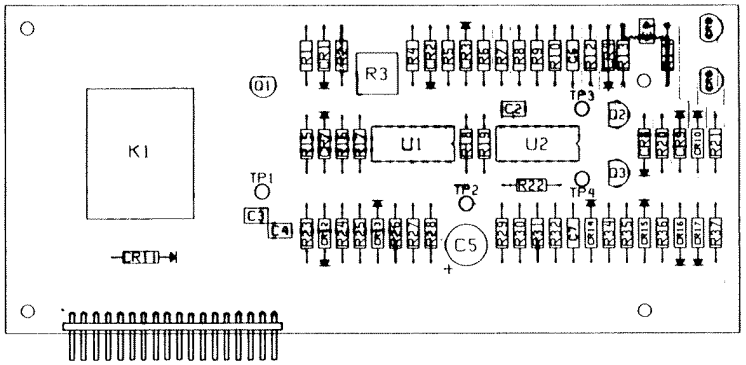
SECO A DIVISION OF DANA CORP LANCASTER, S.C., U.S.A.

TITLE: POWER COMPONENT SCHEM. QUAD R

SIZE D DRAWING NO D34640

SCALE SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1135	7 21 83	DWH

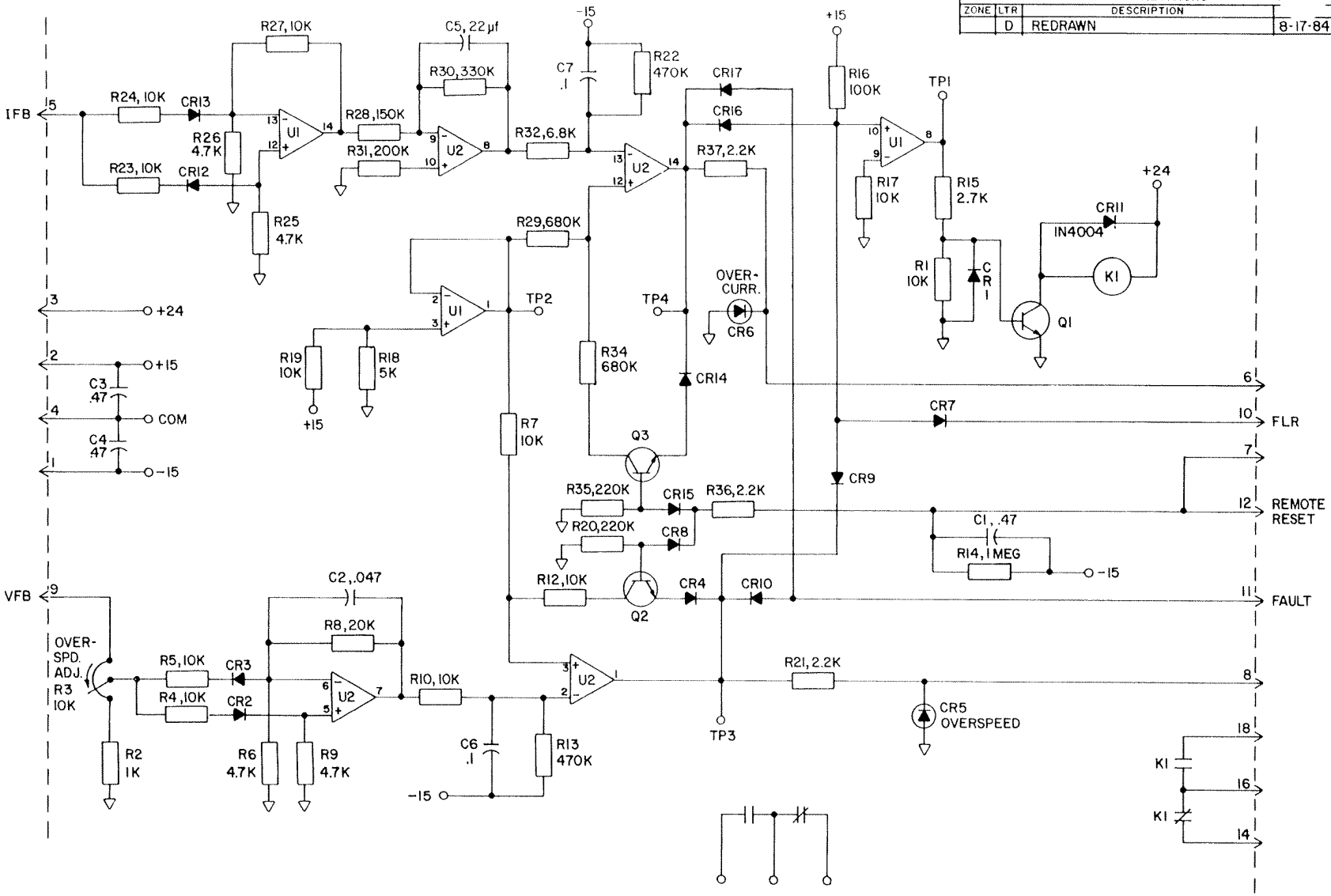


REF. SEE A34636 FOR BILL OF MATERIALS.

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
MATL		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES FRACTIONS ANGLES 2 PLACE DECIMALS	SECO A DIVISION OF DANA CORP LANCASTER, S C , U S A
FINISH		DRAWN BY DTB DATE 11-1-82	TITLE QUAD R FAULT CCT. BOARD ASSY.
NEXT ASSY USED ON		CHECKED BY Dwh 12-6-82	SIZE C DRAWING NO C34636
APPLICATION		APPROVED BY	SCALE NONE SH. 1 OF 1

1. REF. SCHEM. C35141.

NOTES:



NOTES:

1. REF. ASSY. C34636.

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			

MAT'L

FINISH

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ±
FRACTIONS ±
ANGLES ±
3 PLACE DECIMALS ±

DRAWN BY	DATE
HJH	8-17-84
CHECKED BY	
APPROVED BY	

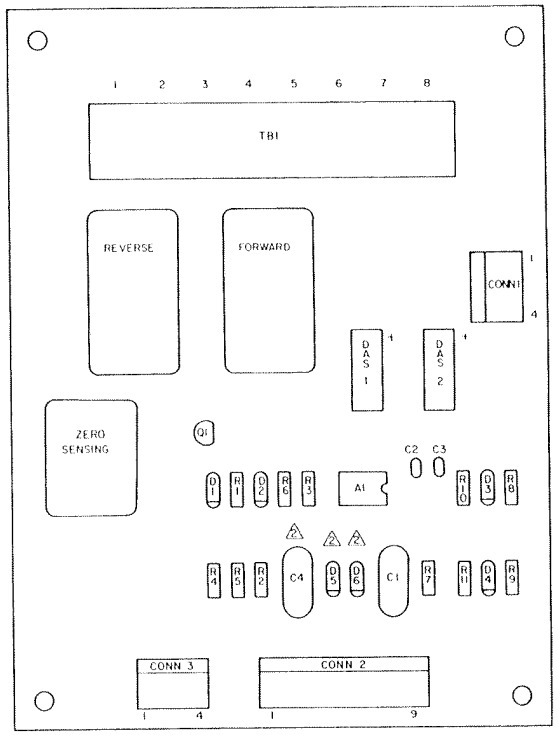
SECO A DIVISION OF DANA CORP. LANCASTER, S.C., U.S.A.

TITLE
SCHEMATIC FAULT CIRCUITRY MODULE
QUAD R

SIZE C | DRAWING NO. C35141

SCALE —— | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



D5		23	PDI3004-00	ZENER DIODE, IN4740
C4		22	PCAI003-02	CAPACITOR, .1/250V
D6		21	PDI1006-00	DIODE, IN4004
R6	1	20	PRE1034-36	RESISTOR, 1 MEG, 1/4 W
R7	1	19	PRE1034-20	RESISTOR, 220K, 1/4 W
R4	1	18	PRE1031-97	RESISTOR, 27K, 1/4 W
R1, R2, R3, R8, R9	5	17	PRE1031-87	RESISTOR, 10K, 1/4 W
R10, R11	2	16	PRE1031-79	RESISTOR, 4.7K, 1/4 W
R5	1	15	PRE1031-63	RESISTOR, 1K, 1/4 W
DAS-1, DAS-2	2	14	PDI5001-00	DIODE BRIDGE, KBP02
D1, D2, D3, D4	4	13	PDI1006-00	DIODE, IN4004
C2, C3	2	12	PCAI005-05	CAPACITOR, .01/100V
C1	1	11	PCAI003-02	CAPACITOR, .1/250V
TB1	1	10	HWA2007-08	TERMINAL STRIP, 8POS.
F, R	2	9	HWA1156-00	RELAY SOCKET
A1	1	8	HWA1116-00	IC SOCKET
CONN 2	1	7	HPA1036-08	MOLEX CONNECTOR, 9POS.
CONN 1, CONN 3	2	6	HPA1036-07	MOLEX CONNECTOR, 4POS.
Q1	1	5	ATR1009-00	TRANSISTOR, 2N5814
ZS	1	4	ARE1012-00	ZERO SENSING RELAY
F, R	2	3	ARE1009-00	RELAY 120 VDC
A1	1	2	AIC1003-00	OP AMP, 1458
	1	1	PCBD35507	P.C. BOARD

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
-00			
ASSEMBLY DASH NUMBER			

MAT'L

FINISH

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±

DRAWN BY DTB 9-26-83

CHECKED BY Dave 9-27-83

APPROVED BY

SECO A DIVISION OF DANA CORP LANCASTER, S C, U S A

TITLE ASSEMBLY REVERSING CARD, QUAD R

QUAD R | SIZE D | DRAWING NO 035508

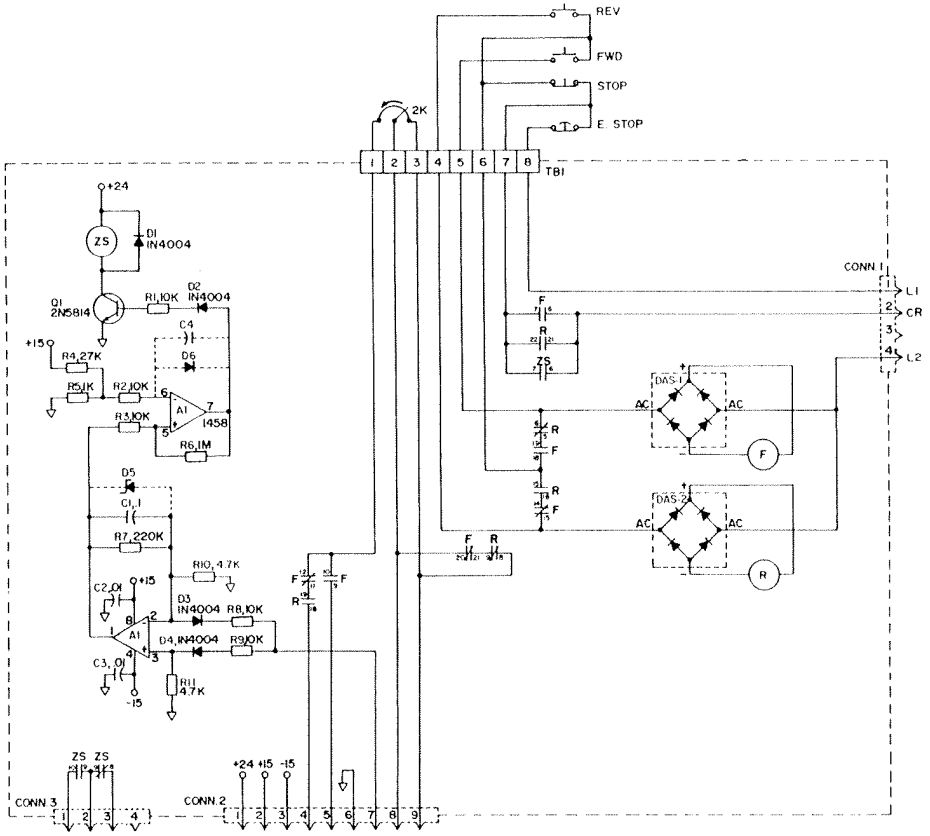
SCALE | SHEET 1 OF 1

/2\ ITEMS 21,22,23 ARE NOT USED ON -00 ASSY.

1 REF. SCHEM. 035497.

NOTES:

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MATL	
		FINISH	
NEXT ASSY / USED ON			
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONS ± ANGLES ± 2 PLACE DECIMALS ±

DRAWN BY MJH — DATE 9-9-83

CHECKED BY

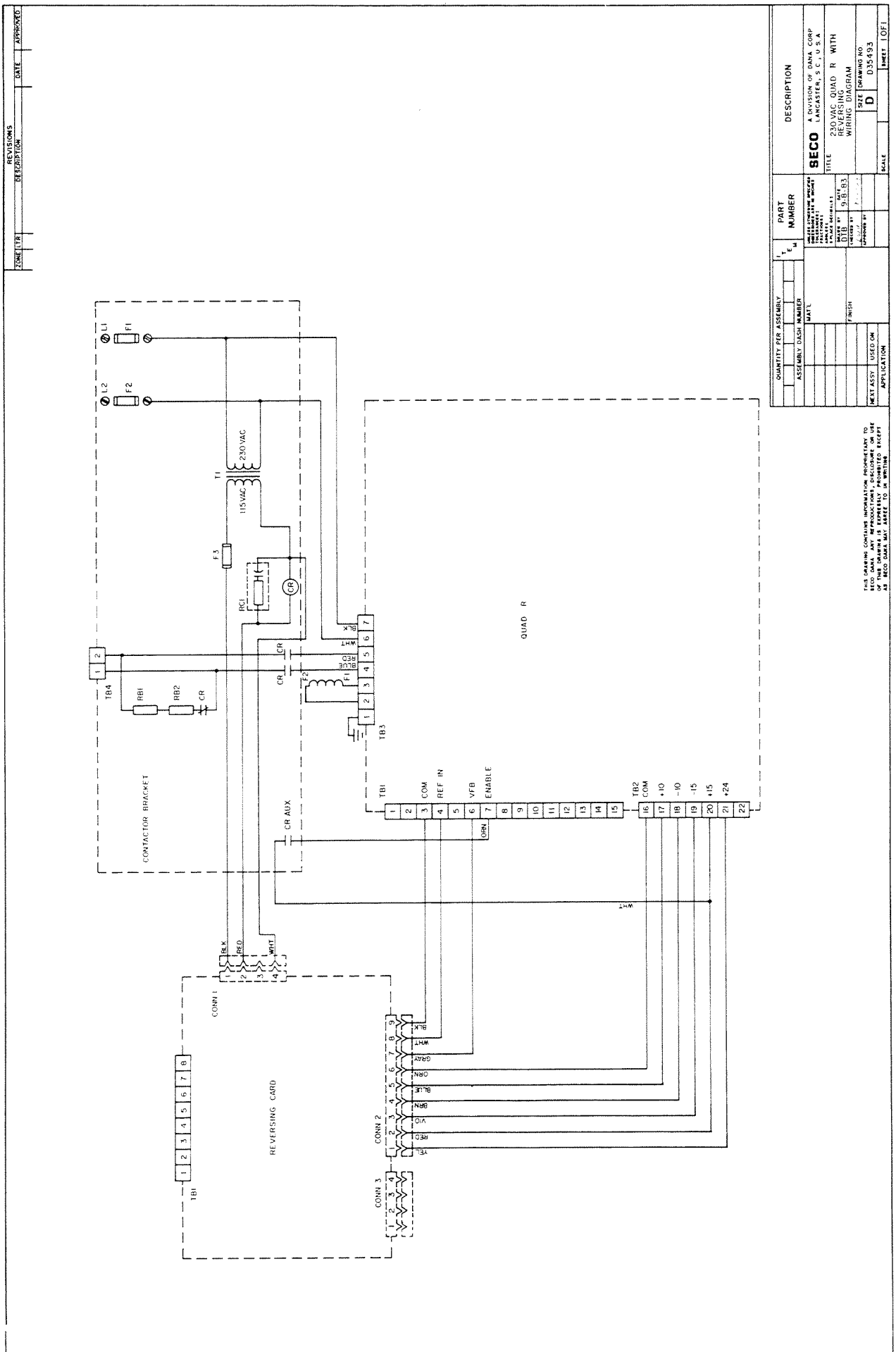
APPROVED BY

SECO A DIVISION OF DANA CORP LANCASTER, S C , U S A

TITLE REVERSING CARD QUAD R

SIZE D — DRAWING NO D35497

SCALE —— SHEET 1 OF 1


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVED
L1
L2
F1
F2
T1
230 VAC
115 VAC
F3
RC1
CR
TB4
RB1
RB2
CR
CR AUX
TB3
BLK
WHT
RED
BLUE
QUAD R
TB1
COM
REF IN
VFB
ENABLE
TB2
COM
+10
-10
-15
+15
+24
CONN 1
CONN 2
CONN 3
REVERSING CARD
TB1
BLK
RED
WHT
GRAY
ORN
BLUE
BRN
VIO
RED
YEL
CONTACTOR BRACKET
QUANTITY PER ASSEMBLY
ASSEMBLY DASH NUMBER
PART NUMBER
DESCRIPTION
SECO
A DIVISION OF DANA CORP
LANCASTER, S C, U S A
TITLE
230 VAC QUAD R WITH
REVERSING
WIRING DIAGRAM
SIZE
D
DRAWING NO
035493
SHEET 1 OF 1
NEXT ASSY
USED ON
APPLICATION
SCALE
FINISH
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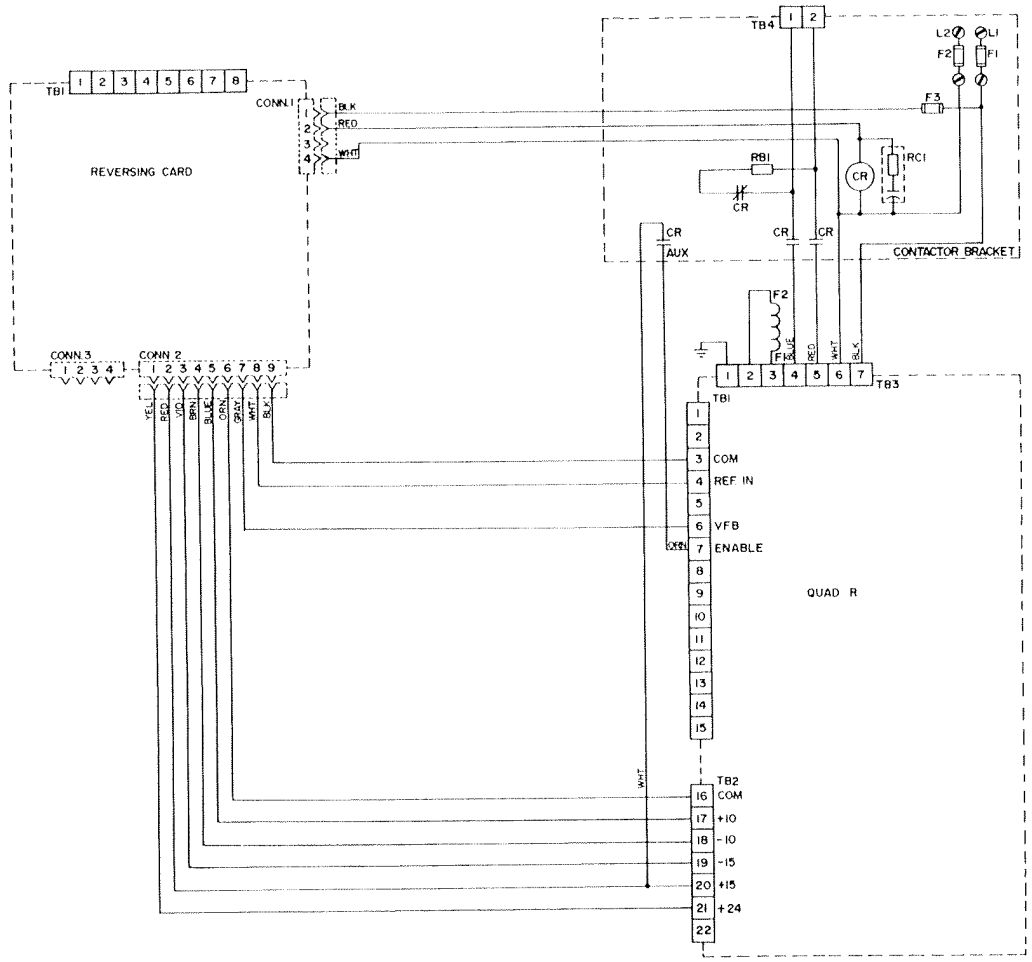
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 1185	12.22.83	



QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MAT'L	
		FINISH	
NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ±.01/64 3 PLACE DECIMALS ±.005

DRAWN BY HJH DATE 9-8-83

CHECKED BY

APPROVED BY

SECO A DIVISION OF DANA CORP LANCASTER, S C , U S A

TITLE 115VAC QUAD R W/REVERSING WIRING DIAGRAM

SIZE D DRAWING NO D35494

SCALE ——— SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

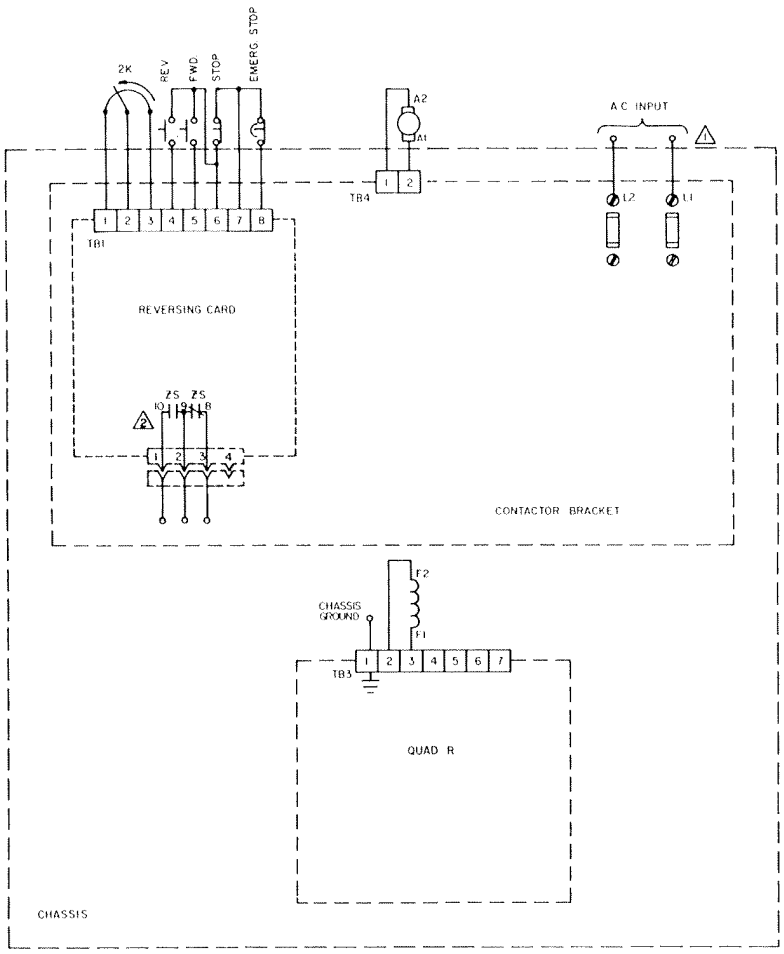


TABLE I		
MODEL #	A.C. INPUT	MOTOR ARMATURE
6111	115 VAC	90 VDC
6151	230 VAC	180 VDC

2 CUSTOMER AVAILABLE ZERO SENSING RELAY CONTACTS AT CONNECTOR 3. CONNECTOR 3 INTERFACES WITH AMP PART 640 428-4.

1 SEE TABLE I.

NOTES:

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
MATL			
FINISH			
NEXT ASSY / USED ON			
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONAL ±1/64, 2 PLACE DECIMALS ±.01

DRAWN BY DTB DATE 9-9-83

CHECKED BY

APPROVED BY

SECO A DIVISION OF DANA CORP LANCASTER, S.C., U.S.A.

TITLE QUAD R W/ REVERSING CONNECTION DIAGRAM

SIZE D DRAWING NO D35498

SCALE SHEET 1 OF 1

QUAD R MODEL 6150 REPLACEMENT PARTS

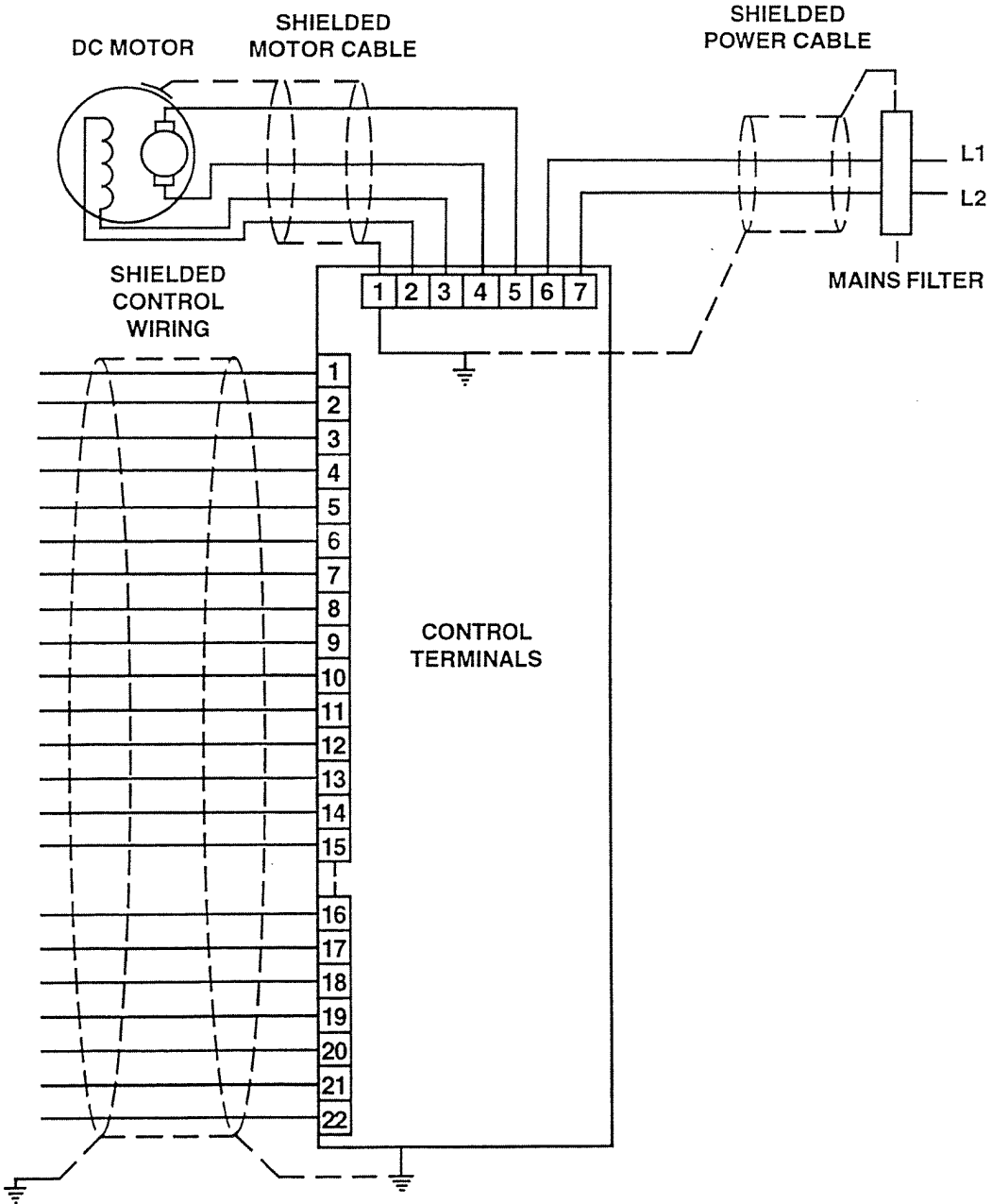
Description	SECO Part No.
Velocity Loop Assembly	WC34627-00
Power Supply/IFB Assembly	WC34633-00
Current Regulator Assembly	WC34630-00
Fault Module Assembly	WC34636-00
Mother Board Assembly	WC34642-00
Power Component Board	WD34639-03
Power Module, 50 Amp	ATY4017-00
Fuse, KAX60, 60 Amp	PFU1002-06
Field Fuse, 2 Amp	PFU1004-05
Control Fuse, .5 Amp	PFU1004-01

EMI Reduction Connections

In order to reduce the amount of radiated Electro-Magnetic Interference and to reduce the susceptibility of the drive to interference from other devices the drive should be installed in accordance with the following instructions.

1). The drive must be mounted in a totally enclosed steel cabinet.
2). All metal mating surfaces used for grounding and bonding must be cleaned of paint and coating material to insure good electrical bonding occurs between the metal surfaces.
3). RF Grounding finger stock (such as Instrument Specialties Series 97-951) must be mounted around the inner edges of the enclosure door. Before installing this grounding stock, the paint must be removed from the area it will contact on both the enclosure and the door. These areas must then be treated with an appropriate coating to prevent corrosion.
4). All Power and control wiring entering or leaving the enclosure must be either enclosed in flexible metal conduits terminated with metal grounding hoods at each end, or use shielded cable with the shields terminated to a ground connection at each end.
5). A power line input filter Corcom Type 15ET1 or equivalent must be installed at the power input of the drive with good electrical bonding to the wall of the enclosure.

The drive was installed by following the above instructions and was tested in an independent laboratory. The drive was found to be in conformance with the CE EMC directive but there is no guarantee that these findings can be transferred to a particular drive in a specific installation.



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