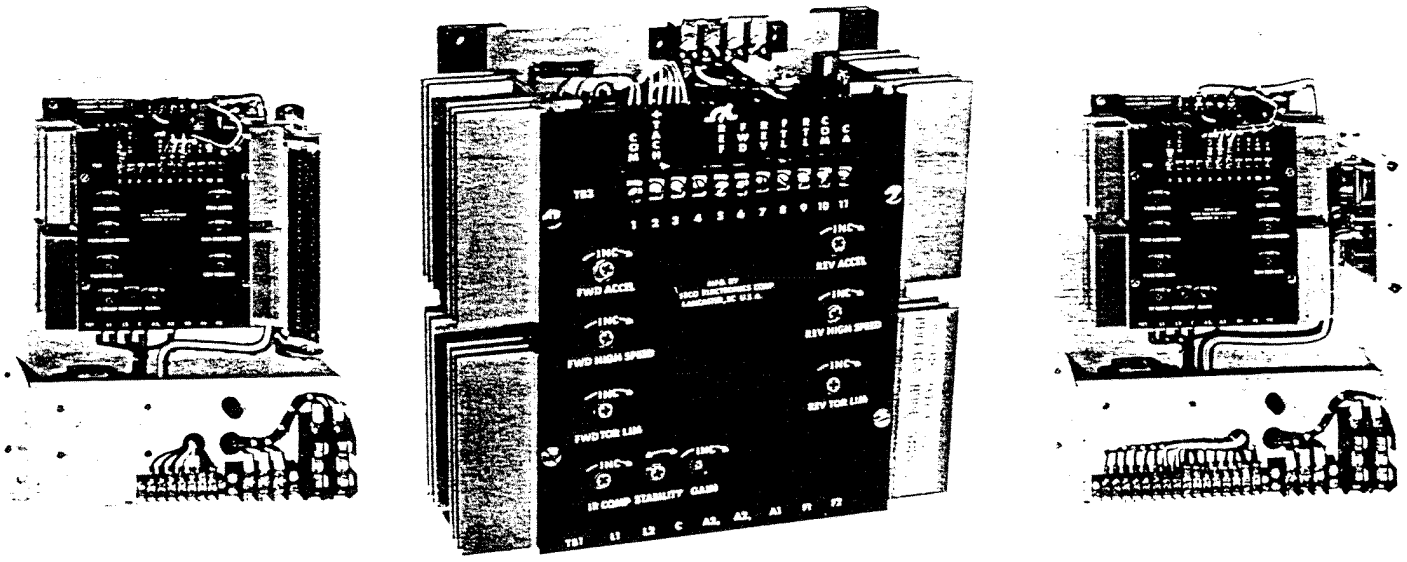
SECO

CRUSADER®
6000 SERIES
MOTOR SPEED CONTROLS

INSTRUCTION MANUAL



MODELS 6500, 6600, 6700

SECO ELECTRONICS
BOX 697, RT. 4, HWY 29
LANCASTER, SOUTH CAROLINA 29720
Phone: (803) 286-6927

BULLETIN 6000-2
PRICE $8.00

DANA INDUSTRIAL

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GENERAL DESCRIPTION

1. DESCRIPTION

The Seco 6000 Series is a regenerative full wave silicon controlled rectifier (SCR) system which converts A. C. voltage to a variable D. C. voltage of either plus or minus polarity so that the speed of the D. C. motor can be varied anywhere from maximum speed in one direction to maximum speed in the other direction statically without the use of armature or field contactors. Also during decelerations the drive acts as an A. C. line-commutated invertor which converts the D. C. motor armature voltage to a "chopped" A. C. waveform at the A. C. input terminals, at a higher level than the A. C. supply at that time, so that current is allowed to flow through the motor armature back into the A. C. line. This is known as regeneration. The Seco 6000 Series is known as a four-quadrant drive because of its ability to produce positive and negative torque in either direction of rotation.

The Seco 6000 Series system consists of the following equipment:

1.1 THE SECO POWER UNIT

The Seco power unit includes two printed circuit boards which contain the control circuits and necessary adjustments. Also provided on the lower board are the associated power circuitry which drives the SCR bridge contained in the four heat sinks.

1.2 THE DRIVE MOTOR

The drive motor is an adjustable speed shunt wound D. C. motor. The standard Seco D. C. motor is designed to operate continuously at full rated torque over a minimum 20:1 speed range.

1.3 MODEL IDENTIFICATION

Every Seco motor speed control, when it leaves the factory, has a model number and a serial number. Make reference to these numbers should it ever become necessary to consult the factory.

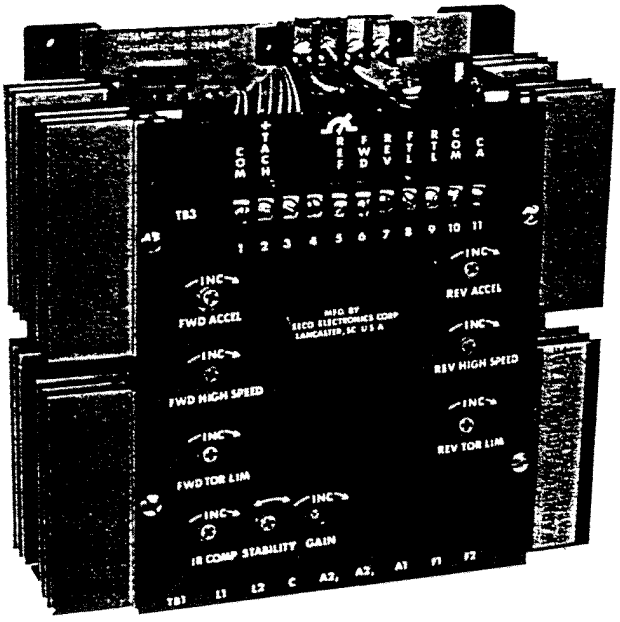
The table below lists the various models in the 6000 Series of controls. The model number is a four digit number. The first two digits indicate the voltage and horsepower range of the motor control. Model 65XX designates 120-0-120 VAC 60Hz input with a horsepower range between 1/4 and 1 horsepower. Model 66XX designates 230-0-230 VAC 60 Hz input with a horsepower range between 1/2 and 2 horsepower. Model 6700 designates 230-0-230 VAC 60 Hz input with a range between 3 and 5 horsepower. The last two digits complete the definition of the control and the dash number defines the enclosure.

Standard models for 6000 Series SCR motor speed controls

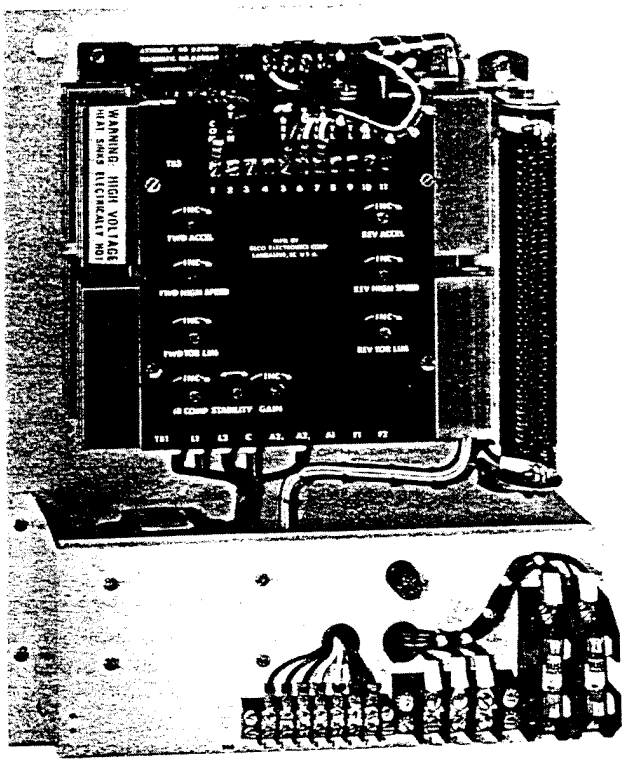
XX	DESCRIPTION
00	Basic control module assembly supplied with external speed potentiometer assembly. NOTE: This assembly is designed for OEM applications and is to be used mounted in control console or enclosure.
04	Basic control with armature disconnect contactor and fusing, offering regenerative reversing and dynamic braking operation, supplied in a Nema I enclosure.
03	Basic control with the armature disconnect contactor and fusing, offering regenerative reversing and regenerative braking operation, supplied in a Nema 1 enclosure with emergency stop by dynamic breaking.

OPTIONAL ENCLOSURE IDENTIFICATION

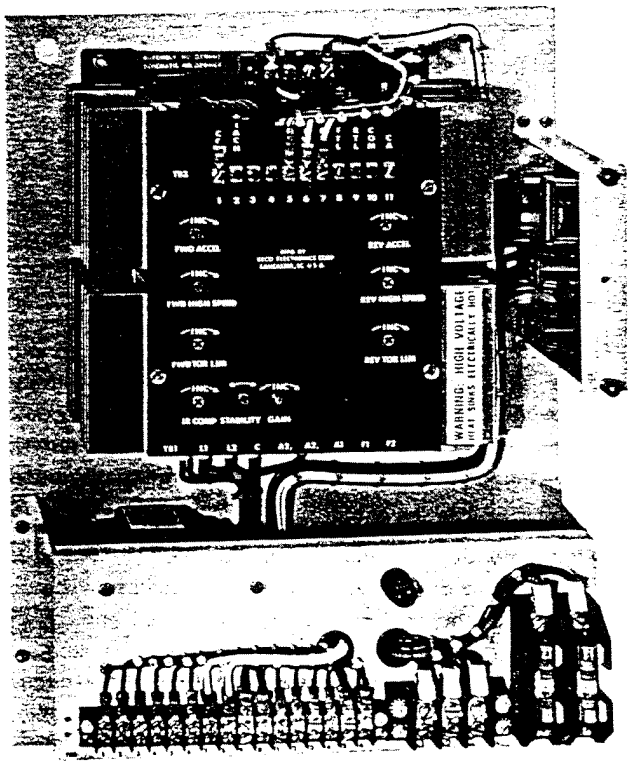
-N49	Nema 4 enclosure (20 x 16 x 8)
-N27	Nema 12 enclosure (20 x 16 x 8)



Basic Control Module Assembly, Model 6500, Model 6600 and Model 6700, as described above.



Control Module Assembly, Model 6504, Model 6604 and Model 6704, as described on page 2.



Control Module Assembly, Model 6503, Model 6603 and Model 6703, as described on page 2.

1.4 TWO BASIC REMOTE STATIONS ARE USED WITH THE 6000 SERIES.

Several optional features are available with each one and are identified by a dash number.

1.4.1 BASIC REMOTE STATIONS

Part No.	DESCRIPTION
6001	Start-Stop push buttons, FWD/REV selector switch and speed adjust potentiometer.
6002	Emergency Stop, FWD/REV, stop push buttons, and speed adjust potentiometer .

1.4.2 OPTIONAL FEATURES

Dash No.	DESCRIPTION
-710	Ten turn speed adjust in place of single turn.
-RJ	Run-Jog option with Run-Jog selector switch, Jog speed adjust (internally located) and Job push button (part of start button function)
-F17	Tach follower, for a full range input voltage of 25 to 100VDC, a ratio adjustment is internally located. The standard speed adjust functions as a manual speed adjustment and an automanual selector switch is located on the front.

1.5 TECHNICAL DATE AND PHYSICAL SPECIFICATIONS

Specifications for the Seco Regenerative SCR motor speed controls, series 6500, 6600, and 6700.

The characteristics of the "Regenerative" series are

- Input voltage
  230VAC center tapped (120-0-120VAC), single phase 6500 series.
  460VAC center tapped (230-0-230VAC), single phase, 6600 and 6700 series.
- Horsepower range:
  1/4 through 1 HP, 6500 Series
  1/2 through 2 HP, 6600 Series
  3 and 5 HP, 6700 Series
- Operating temperature: 0° to 50°C
- Speed range: function of motor, 100:1 possible
- Feedback:
  Outer voltage loop; Armature or Tachometer (selectable)
  Inner current loop, for fast response
- Load regulation: (95% load change)
  ±1% of base speed, armature feedback
  ±1/2% of base speed, tachometer feedback

- Line regulation: (+10%, -5%)
  ±1% of base speed, armature feedback
  ±1/2% of base speed, tachometer feedback
- Full wave rectification
  100VDC field and 0 ±90VDC armature, 6500 series
  200VDC field and 0 ± 180 VDC armature, 6600 and 6700 series
- Line voltage compensation
- Line transient protection: MOV and snubber
- dv/dt protection
- Line fuses, current limit type (all but basic controls)
- Adjustments
  High speed (one forward and one reverse)
  Current limit 0-200% (one forward and one reverse)
  Linear acceleration and deceleration .2 to 10 seconds (approx.) (one forward and one reverse)
  IR compensation (armature feedback only)
  Stability for matching systems response
  Gain (loop) dead band adjust
- Preset speed control
- Small size, basic units only 9" x 9" x 3¾"
- Hard pulse firing circuitry
- Cross fire lockout protection
- Screw type terminals for all customer connections
- Input signal 0 to ± 10VDC

INSTALLATION

2. INSTALLATION

2.1 MOTOR INSTALLATION

Seco supplied D. C. motors are available for base mounting or with C face. The drive motor may be connected to the load through a variety of methods. When a motor is coupled through a gear reducer; make certain that the C flanges are properly mated. If the motor is connected to the load by belting it is important that the sheaves be in line. Check belt tightness. A belt that is too loose will result in excessive slippage. Direct coupling is best accomplished by using a flexible coupling. NOTE: A properly connected direct coupled load does not exert forces on the motor shaft in any direction.

2.2 DIRECTION OF MOTOR ROTATION

The standard direction of rotation is counterclockwise (CCW) looking at the end opposite the drive shaft (CW looking at the drive shaft end). Seco supplied motors connected as shown in the diagrams will rotate in the (CCW) direction with control operating in the forward mode.

2.3 MOTOR CONTROL MOUNTING

The 6000 series controls are designed for wall mounting. Figure 1.2 gives the chassis dimensions. Figure 1.1 shows the basic control dimensions. See Figure 1.3 for Nema I and Figure 1.4 for Nema 4JIC and Nema 12 JIC dimensions.

2.3.1 LOCATION

Install the control in an area such that louvers on the enclosures are not blocked from adequate cooling air. The cabinet must be free of chemical fumes, oil vapors, steam, excessive moisture and dust. The maximum ambient temperature should not exceed 50° C.

The unit should not be installed in the vicinity of a hazardous process or combustible fumes.

2.4 CIRCUIT PROTECTION

Local codes required adequate circuit protection upon installation. Model 6000 series controls are supplied from stock with current limiting type fuses (all but the basic modules).

The 6000 series must be fused per local electrical code upon installation and should be sized to protect the isolation transformer and control. The table below shows the recommended transformer size and control fusing for each HP range.

Table 2.4

MODEL	HP RANGE	ARM. VOLTS	XFMR KVA	FUSE
6500	1/4 – 1/2	90	1.5	10a SC
	3/4 – 1	90	3	20a SC
6600	1/2 – 1	180	3	10a SC
	1 1/2 – 2	180	5	20a SC
6700	3	180	7.5	30a SC
	5	180	10	50a SC

2.5 CONNECTION INSTRUCTIONS

No terminal point in the control should be grounded except where such grounding is shown on the drawings or is approved by Seco Electronics Corporation. This instruction, however, does not apply to control cabinet, chassis and motor frame grounding, which we recommend be grounded.

Provide shielding for interconnecting signal wiring. Use Belden #8208 2-conductor and/or #8771 3-conductor shielded cable or their equivalents. Shielded cable should be used for connecting such devices as speed and jog pots, tachometers, speed indicators, and ammeters, and other devices in the system reference and feedback circuitry. The shield should be connected to one point only, at control common terminal point. TB3-1 or TB3-10. The other end of the shield should be taped off by itself. DO NOT RUN SIGNAL WIRING IN CONDUIT WITH ANY POWER WIRING.

2.5.1 MOTOR ARMATURE CONNECTION

Armature wires should be run in separate conduit. Before installing the motor control verify the horsepower of the motor to be used with the control. Armature leads A1 and A2 are connected to TB1 or TB4 depending on the particular model of control being used. Refer to Figures 2.5 and 2.6 for the location of these terminal strips. The motor control can be used to operate motors over a wide range of horsepower simply by the proper connection of armature lead A2 to the terminals on terminals strip TB1. The table below lists the horsepower range and the corresponding terminal on TB1.

MODEL 6500

HP	CONNECT ARMATURE LEAD A2 TO:
1/4 – 1/2	TB1 - 5
3/4 – 1	TB1 - 4

MODEL 6600

HP	CONNECT ARMATURE LEAD A2 TO:
1/2 – 1	TB1 - 5
1 1/2 – 2	TB1 - 4

MODEL 6700

HP	CONNECT ARMATURE LEAD A2 TO:
3	TB1 - 5
5	TB1 - 4

On models that require user connections of the armature leads to TB4 it will be necessary to move the wire connected to TB1. Refer to the tables above for proper connection.

2.5.2 MOTOR FIELD CONNECTIONS

Several manufacturers supply motors with dual voltage fields. Seco 6000 Series controls are set up to use the high connection in all cases. Refer to the instructions supplied by motor manufacturer for proper connections.

2.5.3 ARMATURE FEEDBACK OR TACHOMETER FEEDBACK MODE

Either mode of operation is selectable. As shipped from the factory the armature mode is selected by a jumper between terminals TB3-2 and TB3-3. To change to tachometer feedback remove the jumper between TB3-2 and TB3-3 and connect the tachometer generator as shown in connection diagrams.

START-UP & ADJUSTMENT PROCEDURE

3. START-UP ADJUSTMENT PROCEDURE

The following start-up instructions are intended only as a guide, and each step should be clearly understood by the personnel responsible for installation, before proceeding with it.

The customer should also understand that when starting up a system for the first time, the following occurrences may take place as a result of an improper or missing system interconnection.

(a) Drive may run in the wrong direction.

(b) Drive may accelerate to maximum speed.

With these factors in mind, it is imperative that all other personnel be kept at a safe distance from the machinery when starting up the electrical drive system.

Before applying power to the drive, check the following: No terminal point in the control should be grounded except where such grounding is shown on the drawings or is approved by Seco Electronics Corporation. This instruction, however, does not apply to the grounding of the control cabinet and motor enclosures, which we recommend be grounded.

Check that the input voltage and frequency of the available power supply agree with the rating of the drive control system.

WARNING

HIGH VOLTAGES TO GROUND ARE PRESENT IN THE SECO SCR 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). High voltage to ground exists on the speed pot circuit.

B. The motor armature brushes and field supply are electrically "HOT" regardless of whether the D. C. armature contactor is open or closed. 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 connection 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 Corporation.

E. The D. C. Motor should not be operated without the field connected.

3.1 DESCRIPTION OF CONTROLS

A. MAX SPEED: (one for each direction) This is a means to adjust the highest motor shaft speed when speed adjust potentiometer is set to maximum. Clockwise rotation of this adjustment increases the speed.
NOTE: DO NOT EXCEED RATED ARMATURE VOLTS FOR THE MOTOR.

B. TORQUE ADJUST: (One for each direction) This adjustment limits the maximum amount of armature current supplied to the motor. Clockwise adjustment of this control will increase armature current. (Factory set for 200% of motor rating.)

C. IR COMP: The IR compensation adjustment provides a means to adjust the armature feedback. This feedback is used to compensate for motor losses and to obtain flat load regulation. Clockwise rotation of this adjustment increases the feedback. If the feedback is too low, the motor speed decreases as the load increases. If the feedback is too high, the motor speed increases as the load increases. If feedback is excessive, the system becomes unstable and pulsations may result.

NOTE: In tachometer feedback mode, IR compensation is not required and the potentiometer must be turned fully counter-clockwise to prevent an unstable condition.

D. GAIN: This is an adjustment of over-all loop gain. Clockwise rotation of this adjustment decreases deadband and increases loop gain, (normally set at minimum (CCW) before shipment from the factory).

E. STABILITY: This adjustment controls the response of the drive. For faster response rotate the stability pot CCW until the drive has the desired response or a point of instability (or a roughness in drive speed) is noticed.

F. ACCEL: One forward and one reverse. Clockwise rotation of these adjustments will decrease the time of acceleration. When operating in the forward direction, the reverse direction acceleration adjustment acts as a deceleration pot. When operating in the reverse direction the forward acceleration adjustment acts as a deceleration pot.

3.2 ADJUSTMENTS

A. Provided that the motor is free and safe to rotate, apply A.C. power and increase speed potentiometer setting until motor turns. If the motor rotates in the wrong direction, reduce speed pot setting to zero and remove all A.C. power. Then interchange the armature leads at the motor.

NOTE: A positive reference signal on terminal TB3-5 with respect to terminal TB3-1 (common) will produce a positive SCR output voltage on terminal TB1-6 with respect to TB1-5. A negative reference signal will produce the opposite polarity of output.

B. Apply A. C. power and increase speed potentiometer till motor begins to turn and check for proper operation.

C. Turn the SCR controller "Manual" pot clockwise. The motor will accelerate. Adjust the "Max. Speed" pot to obtain maximum drive speed. (Clockwise to increase).

NOTE: Do NOT exceed rated armature volts for the motor. The armature volts can be measured at terminals TB1-5 and TB1-6. Maximum voltage is 180 volts D. C. for Model 6600 and 6700 and 90 volts D. C. for Model 6500.

D. The load must not exceed the full load rating as stamped on the motor nameplate. It may be necessary to insert a D. C. ammeter in series with the armature to measure the load.

E. Set the "IR Comp" pot as follows:

1. Connect a D. C. ammeter in series with the D. C. motor armature. Range should be 0-30 amperes for a 5 HP motor.
2. Run the motor at approximately 200 RPM.
3. With no load on the motor, monitor the no-load speed.
4. With an appropriate brake, or by exerting peripheral pressure on the motor sheave, load the motor such that the armature current reads nameplate current for the motor.
5. With full load on the motor, adjust the "IR Comp" pot slowly clockwise to obtain a full-load speed that is no greater than 2% below the no-load speed.

NOTE: The "IR Comp" should not be set too high (too far clockwise) or the drive system may become unstable. If the control used tachometer feedback, the "IR Comp" pot should be turned fully counterclockwise.

F. The current limit has been factory set at 200% of rated motor current. This limit should not be exceeded. If it is necessary to lower the current limit setting, the current limit pots should be turned counterclockwise. The ability to load down the motor and to measure the armature current is required to set current limit.

G. The FWD BIAS, REV BIAS, and OP AMP ZERO adjust pots have been set at the factory, and normally should not require further adjustment. Should adjustment be required, consult Factory.

H. The stability pot controls the response of the drive. For faster response rotate the stability pot CCW until the drive has the desired response or a point of instability (or a roughness in drive speed) is noticed.

This completes the SECO ELECTRONICS 6000 Series Set-Up and Adjustments.

DESCRIPTION OF OPERATION

4. DESCRIPTION OF OPERATION

A. ACCELERATION: The drive is so designed that it can accelerate or decelerate a high inertia load by electrically limiting the current to the motor until a preset speed is reached. The speed potentiometer can be set fully clockwise and the "run" pushbutton pressed without harming either the drive or motor if

the current limit is set per the instructions contained in this manual.

B. STOPPING: The basic drive is supplied without armature contactor or dynamic braking. Stopping can be accomplished by reducing the input signal to zero. The drive will then regeneratively brake to a stop. As an alternative the A. C. power can be removed and the motor will coast to a stop.

On the other hand, if the speed reference is decreased the drive will slow down by regeneration until it reaches its new reference speed level. Thus regenerative braking is accomplished by decreasing the speed reference signal.

Armature or tachometer feedback circuitry makes speed essentially constant with varying loads. Torque control is achieved by sensing the armature current. Figure 4.1 is a functional Block diagram of the motor control.

BLOCK DIAGRAM OF CONTROL:

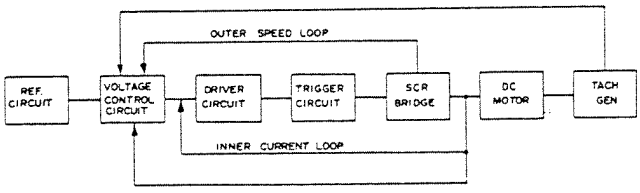


Figure 4.1

4.1 RECTIFIER CIRCUIT

The power section of the Seco Electronics 6000 Series utilizes SCR's connected as shown in the figure 4.1.1.

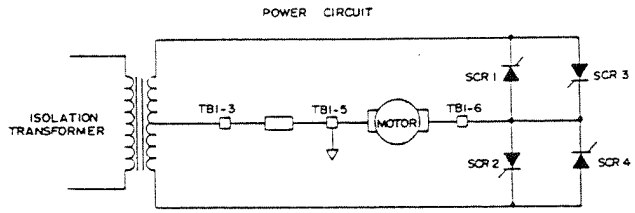


Figure 4.1.1

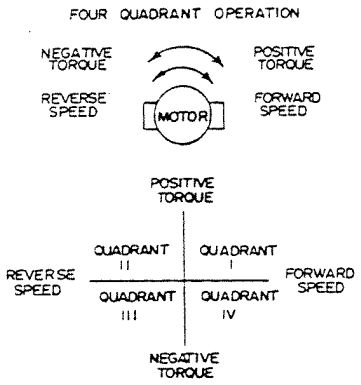
In the forward direction, positive speed reference is applied to terminal TB3-5 with respect to terminal TB3-1 Control (Common) which produces a positive SCR output voltage on terminal TB1-6 with respect to terminal TB1-5. During the positive half-cycle when terminal TB1-1 is positive with respect to TB1-2, SCR #3 is phased on at the appropriate point in the half-cycle. During the negative half-cycle when terminal TB1-1 is negative with respect to terminal TB1-2 SCR #4 is phased on. During each cycle of the 60 Hz supply, SCR's #3 and #4 are alternately phased on at the appropriate time to produce an SCR output voltage, the value of which is determined by the regulator. During this time armature current flows from terminal TB1-6 to terminal TB1-5 with terminal TB1-6 positive with respect to terminal TB1-5. This is known as "motoring" in the forward direction. (Quadrant #1).

Should the control require that the D. C. motor speed decrease SCR's 3 & 4 will be turned off and SCR's 1 & 2 will be phased on. This will cause armature current to flow in the motor armature from terminal TB1-5 to terminal TB1-6 with terminal TB1-5 positive with respect to terminal TB1-6 which will produce a braking torque and cause the motor to decelerate. This braking torque is produced because when a D. C. motor with a fixed field excitation carries armature current, it will produce a torque proportional to this current and in a direction which is dependent on the direction of armature current. While the motor is decelerating it is known as regenerating in the forward direction. (Quadrant #4).

In the reverse direction, when the speed reference signal is negative, and SCR output voltage on terminal TB1-5 is negative with respect to terminal TB1-6 a similar sequence occurs.

While motoring in the reverse direction, SCRs #1 & 2 are phased on. While regenerating in the reverse direction, SCRs #3 & 4 are phased on.

The foregoing parameters are summarized in the following table:



	FORWARD SPEED		REVERSE SPEED	
	MOTORING I	REGENERATING IV	MOTORING III	REGENERATING II
SCR'S 3,4 CONDUCTING	X			X
SCR'S 1,2 CONDUCTING		X	X	
POSITIVE TORQUE	X			X
POSITIVE ARMATURE VOLTAGE	X	X		
POSITIVE ARMATURE CURRENT	X			X
NEGATIVE TORQUE		X	X	
NEGATIVE ARMATURE VOLTAGE			X	X
NEGATIVE ARMATURE CURRENT		X	X	

Table 4.1

Each set of SCR allows the current to flow in only one direction; from the AC line through one of the SCRs through the motor armature, another SCR, and back to the A. C. line. The SCR's establish what voltage between 0 and rated VDC will be impressed across the armature of a D. C. motor. This variable D. C. voltage produces a variable D. C. motor speed as given by the following D. C. motor equation:

$$\text{Motor Speed (RPM)} = \frac{K \times CEMF}{\text{Motor Field Flux}}$$

K is a constant and CEMF is equal to the applied voltage minus the "IR drop" in the motor.

An SCR is a 3-terminal device, compared to a diode, which is only a 2-terminal device. In addition to the cathode and anode that the diode has, the SCR has a Gate Terminal which is used to turn on the controlled rectifier in its conducting direction. Once the SCR is turned on in its conducting direction, it will maintain conduction until the potential across the SCR is reversed. Once the gate has triggered the SCR to its "on" state the gate loses control until the SCR turns off.

4.2 CONTROL CIRCUIT

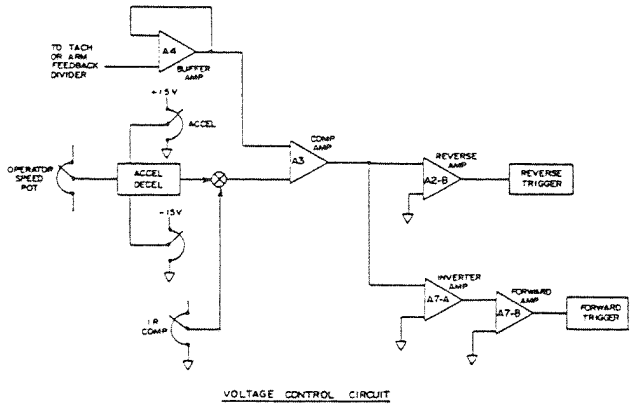


Figure 4.2

A speed reference signal is applied at terminal 5 to the Operational Amplifier A3 via resistor R11. The reference signal is compared with the feedback signal from the motor armature voltage curcuit. The comparison or summation of the reference and feedback signals results in an error signal. When the reference signal is positive and greater than the feedback signal, the error signal at Pin 2 (inverting input) of operational amplifier A3 will be positive, and will be amplified by this amplifier to supply a positive output at Pin 6.

This is inverted by operational amplifier A7-A and applied to the non-inverting input of amplifier A7-B. The output of this amplifier drives the SCR gate pulse triggering circuit for SCRs #3 and 4. They in turn cause armature current to flow in the motor from terminal TB1-6 to terminal TB1-5 producing an increasing amount of output voltage. This voltage will increase until there is approximately zero error between the reference and the feedback voltage. When a steady state condition is reached, the error signal is approximately zero. If the positive reference signal is turned down, the feedback voltage will then be greater than the reference and the output of amplifier A3 will become negative. This is inverted by amplifier A2-B and drives the SCR gate pulse triggering circuit for SCRs #1 and 2. They in turn cause armature current to flow in the motor from terminal TB1-5 to terminal TB1-6 thereby producing a decelerating torque and producing a decreasing amount of SCR output voltage until there is approximately zero error between the reference and feedback signals. A similar operational description applies to the reverse direction when the speed reference signal is negative.

4.3 FIRING CIRCUITRY

In the case of quadrant #1 which is motoring in the forward direction, operational amplifier A7-B has a positive output. The more positive this output is, the less time it takes for capacitor C7 to charge up to the level that will trigger the PUT (Programmable Unijunction Transistor) Q7.

When the voltage on the capacitor is sufficient to trigger the PUT the set of SCRs consisting of SCR #3 and 4 will be gated on by the pulse from the pulse transformer secondary.

A similar description applies to Quadrants #2, 3 and 4.

4.4 CURRENT LIMIT

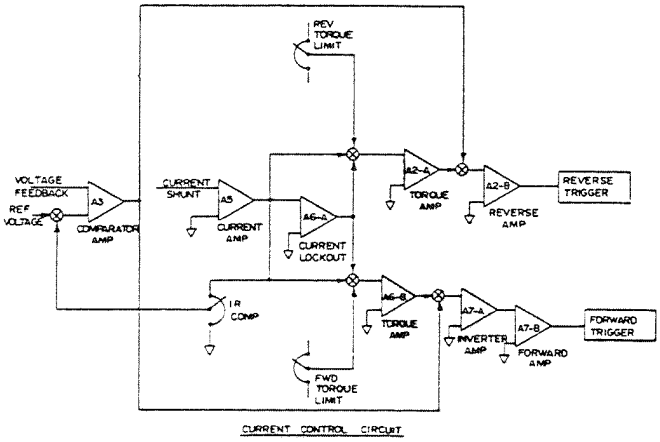


Figure 4.4

The drive is protected against normal overloads by a built-in current limit circuit. To protect the system against major faults, the system must be fused properly.

All of the models except the Basic 6500, 6600, 6700 chassis only models are factory fused with fast acting rectifier fuses.

The current limit signal originates across a shunt resistor in the armature loop. This signal is amplified and filtered by amplifier A5. The output of the amplifier is used to drive the torque limit amplifier A6-B for the forward direction. This signal is also used for the IR compensation signal.

When the armature current gets sufficiently high to cause amplifier A6-B to produce an output the input signal to amplifier A7-A will be reduced by that amount resulting in the SCR firing pulsed being retarded and the armature output voltage being reduced. In this way, the armature current will be limited. In the reverse direction a similar description applies (torque limit amplifier A2-A reduces the signal to amplifier A2-B).

4.4.1 IR COMPENSATION

IR compensation is a signal that is proportional to armature current and is summed with the reference signal to compensate for the loss of speed due to the "IR Drop" in the motor when it is loaded.

4.4.2 PROTECTION

A. All SCRs used have a peak forward and inverse breakover voltage well above the peak value of the A. C. line voltage.

B. A fast current limit circuit that allows the D. C. motor to be accelerated in current limit.

C. MOV voltage transient suppressors, across the AC line.

D. Resistor-capacitor suppression circuits across the SCRs.

E. All models except the basic 6000 series modules are factory fused with fast rectifier fuses, for protection against severe overloads and other faults.

TROUBLE SHOOTING PROCEDURE

5. TROUBLE SHOOTING PROCEDURE

Fast accurate repair must be preceded by an analysis of the problem. Read the complete trouble shooting procedure before attempting to repair the control. Remember, you are looking for a system problem, the control may have failed but the cause of this failure can generally be traced to some other fault within the system. The control is the heart of most systems, so isolate your problem quickly by going through the following steps:

5.1 OPERATIONAL CHECK LIST:

A. Motor will not reach desired operating speed.
   1. Motor overloaded: Check load current.
   2. Maximum speed improperly set: See Section 3.1
   3. Torque adjust set too low: See Section 3.1
   4. Gain adjust set too low: See Section 3.1
   5. Defective component on control board: Replace Board
   6. Defective component on power board: Replace Board
   7. Defective SCR: Replace control
   8. Defective isolation transformer: Check Transformer voltage

B. Motor speed is unstable (pulsates or increases in speed as load is placed on motor)
   1. IR comp set too high (turn CCW to decrease) – turn to zero if operating in tachometer feedback mode.
   2. Stability pot not set correctly, adjust for smooth operation.
   3. Defective component on control board: Replace Board
   4. Defective component on power board: Replace control
   5. Defective SCR: Replace control
   6. Defective Tachometer: Replace Tachometer.

D. Motor speed drifts or changes abruptly.
   1. Gain adjust set too low: See Section 3.1
   2. Defective component on control board: Replace Board
   3. Defective component on power board: Replace Control
   4. Defective tachometer: Replace Tachometer
   5. Defective SCR: Replace Control.
   6. Defective motor: Replace Motor.

E. Control Blows Fuses:
   1. Incorrect wiring of control, motor or insolation transformer: Recheck all wiring.
   2. Defective component on control board: Remove power to control and unplug connector between control board and power board. Reapply power. If control no longer blows fuses, replace control board.
   3. Defective component on power board: Replace module.
   4. Defective SCR: Replace control.
   5. Defective Isolation Transformer: Check transformer voltage.
   6. Defective motor:

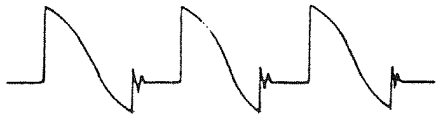
F. No output from control:
   1. Blown fuse or fuses:
   2. Defective component on control board: Replace board or control.
   3. Defective component on Power Board: Replace Control.
   4. Defective Isolation Transformer: Check Transformer voltage.
   5. Incorrect wiring: Recheck all wiring.

5.2 ARMATURE VOLTAGE AND ARMATURE CURRENT WAVEFORMS:

Figure 5.2 shows typical oscilloscope waveforms. Under normal operating conditions, both motoring and regenerating, forward and reverse.

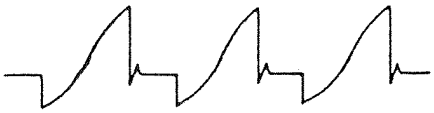
OSCILLOSCOPE WAVEFORMS

MOTORING
POSITIVE
ARMATURE VOLTAGE



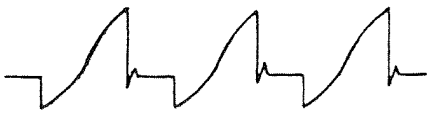
MOTORING POSITIVE
ARMATURE CURRENT
ACROSS R5, R6

REGENERATION
POSITIVE
ARMATURE VOLTAGE



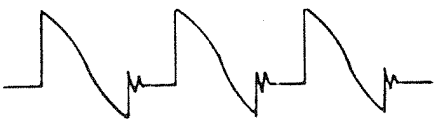
REGENERATION NEGATIVE
ARMATURE CURRENT
ACROSS R5, R6

MOTORING
NEGATIVE
ARMATURE VOLTAGE



MOTORING NEGATIVE
ARMATURE CURRENT
ACROSS R5, R6

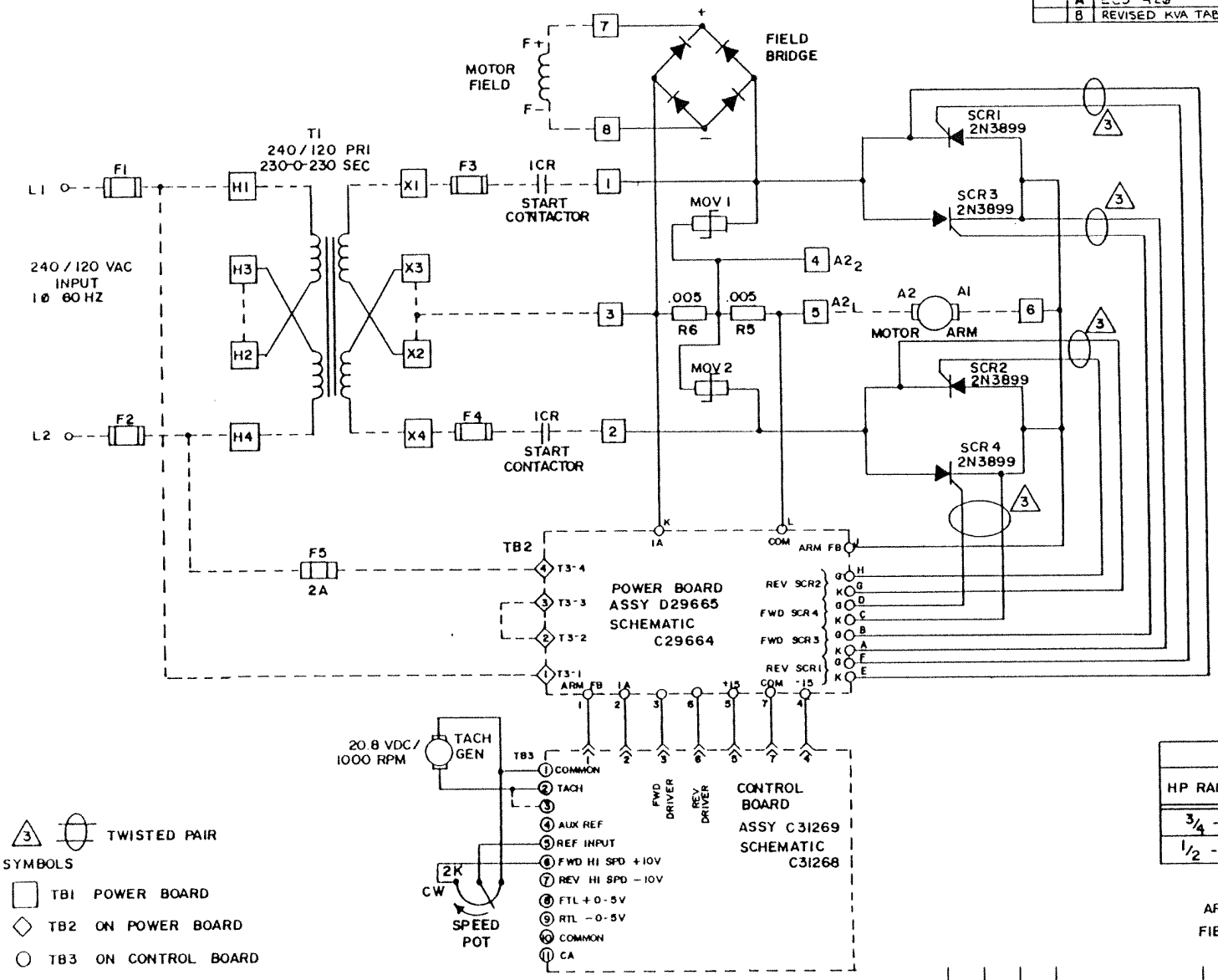
REGENERATION
NEGATIVE
ARMATURE VOLTAGE



REGENERATION POSITIVE
ARMATURE CURRENT
ACROSS R5, R6

Figure 5.2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 426	9-2-77	JMS
	B	REVISED KVA TABULATION	6-20-78	EEC



TABULATION		
HP RANGE	CONNECT A2 TO	TI KVA
3/4 - 1	TB1-4	3
1/2 - 1/4	TB1-5	15

ARM VOLTS - 90 VDC
FIELD VOLTS - 100 VDC

SYMBOLS

△3 ⊖ TWISTED PAIR

□ TB1 POWER BOARD

◇ TB2 ON POWER BOARD

○ TB3 ON CONTROL BOARD

—⟨— PC B CONNECTOR ON CONTROL BOARD

o SOLDER CONNECTION ON POWER BOARD

△2 CONNECT TB2-3 TO TB2-2 FOR 240 VAC INPUT
CONNECT TB2-4 TO TB2-3 & TB2-2 TO TB2-1
FOR 120 VAC INPUT

NEXT ASSY	USED ON
APPLICATION	

MAT'L

FINISH

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

DRAWN BY	DATE
SWS	5-12-75
CHECKED BY	
APPROVED BY	

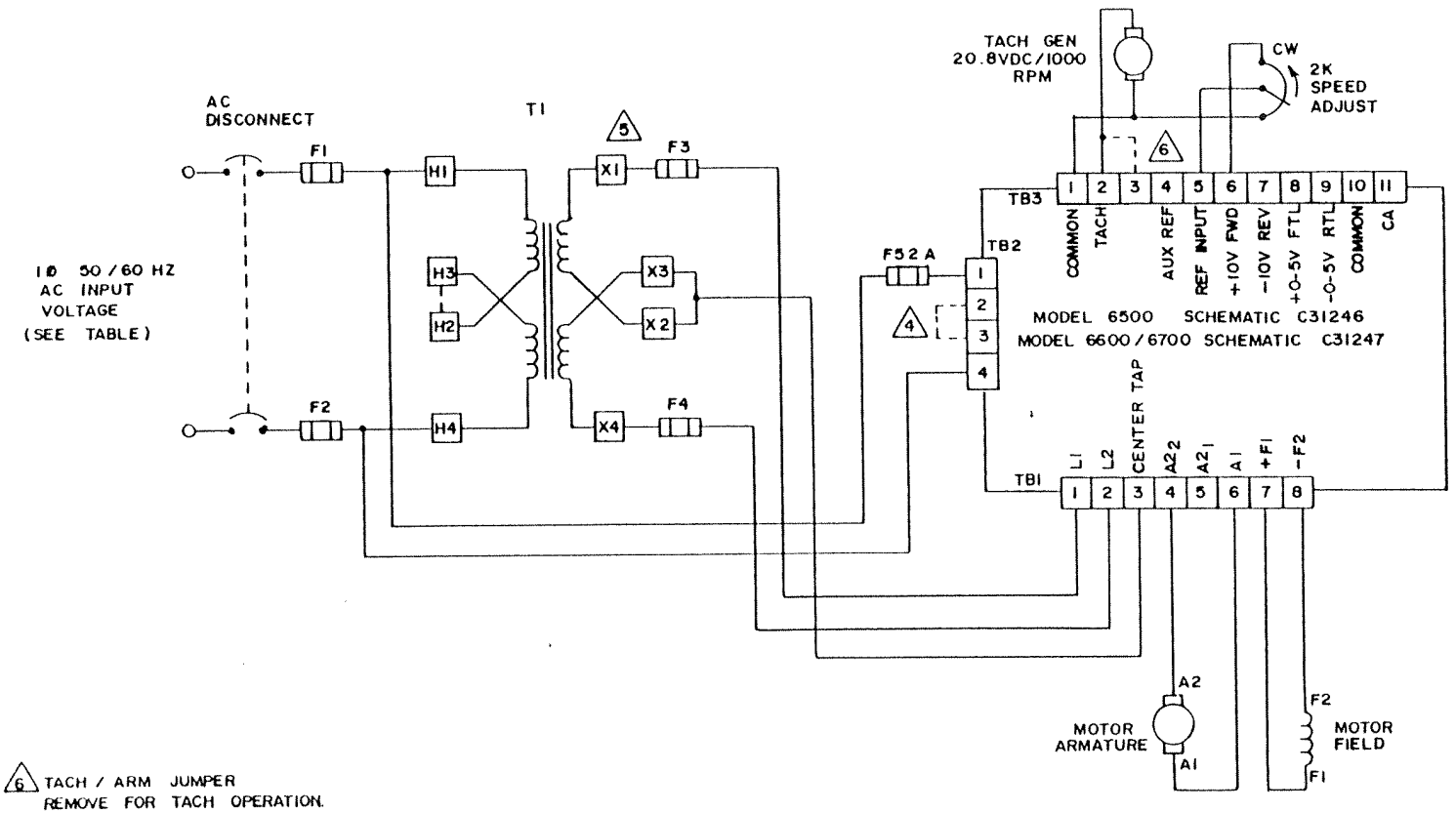
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6500 REGENERATIVE

SIZE C | DRAWING NO. C31246

SCALE —— | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISED KVA TABULATION	6-20-78	RKL



6 TACH / ARM JUMPER
REMOVE FOR TACH OPERATION.

5 FOR HIGH VAC INPUT CONNECT H2 TO H3 AS SHOWN AND FOR LOW VAC INPUT CONNECT H1 TO H3 AND H2 TO H4.

4 TB2 TERMINAL CONNECTIONS. ---- INDICATES JUMPER: FOR HIGH VAC INPUT CONNECT 2 TO 3, FOR LOW VAC INPUT CONNECT 1 TO 2 AND 3 TO 4.

3. TB1 & TB2 ARE LOCATED ON POWER BOARD. TB3 IS LOCATED ON CONTROL BOARD.

2. F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1. F1 F2 TO BE RATED PER KVA RATING OF XFMR.

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	TI KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	TI SEC. VOLT
6500	1/4 - 1/2	$A2_1$	90	100	1.8	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6600	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			5			
6700	3	$A2_1$			7.5			
	5	$A2_2$			10			

MAT'L
FINISH
NEXT ASSY | USED ON
APPLICATION

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

DRAWN BY SWS DATE 5-12-75
CHECKED BY
APPROVED BY

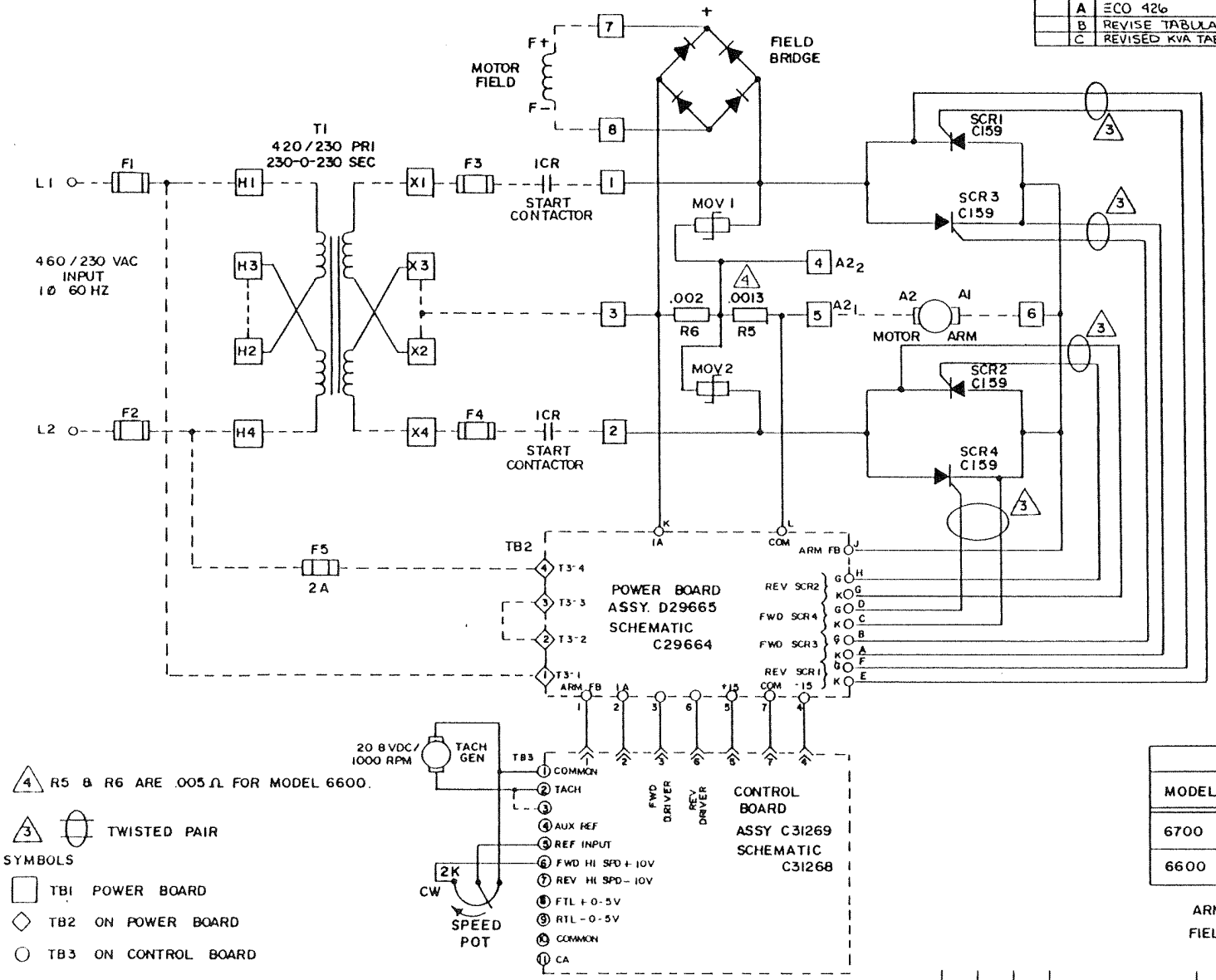
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE
CONNECTION DIAGRAM MODEL 6500/6600/6700 REGENERATIVE DRIVES

SIZE C DRAWING NO. C31248

SCALE —— SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 426	9-2-77	
	B	REVISE TABULATION	9-2-77	WHS
	C	REVISED KVA TABULATION	6-20-78	RRC



TABULATION			
MODEL	HP RANGE	CONNECT A2 TO	TI KVA
6700	3	TB1 - 5	7.5
	5	TB1 - 4	10
6600	½ - 1	TB1 - 5	3
	1½ - 2	TB1 - 4	5

ARM VOLTS = 180 VDC

FIELD VOLTS = 200 VDC

△4 R5 & R6 ARE .005 Ω FOR MODEL 6600.

△3 TWISTED PAIR

SYMBOLS

- □ TB1 POWER BOARD
- ◇ TB2 ON POWER BOARD
- ○ TB3 ON CONTROL BOARD
- —(<— PC B CONNECTOR ON CONTROL BOARD
- o SOLDER CONNECTION ON POWER BOARD

△2 CONNECT TB2-3 TO TB2-2 FOR 460 VAC INPUT
CONNECT TB2-4 TO TB2-3 & TB2-2 TO TB2-1 FOR 230 VAC INPUT

MAT'L

FINISH

NEXT ASSY | USED ON

APPLICATION

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

DRAWN BY SWS DATE 5-13-75

CHECKED BY

APPROVED BY

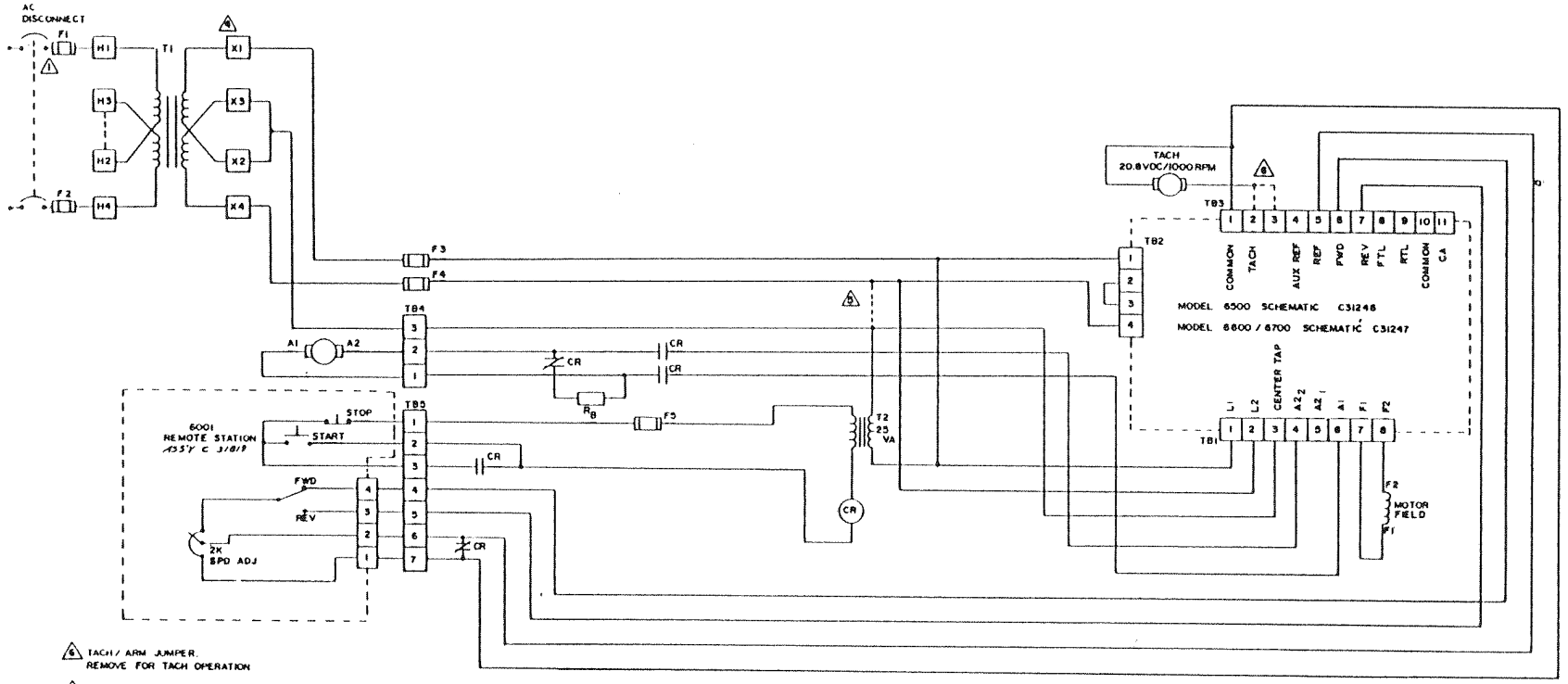
SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6600/6700 REGENERATIVE

SIZE C DRAWING NO. C31247

SCALE —— SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISE NOTES 5	8-30-77	
	B	ADD REMOTE STA. ASSY NO	10-14-77	
	C	REVISED KVA TABULATION	4-20-78	



6 TACH / ARM JUMPER.
REMOVE FOR TACH OPERATION

3 T2 CONNECTIONS ; FOR 6604 - 6704, CONNECT T2 PRIMARY TO F3 AND TB4-3
FOR 6004 ,CONNECT T2 PRIMARY TO F4 AND F3.

4 T1 TERMINAL CONNECTIONS ------- INDICATES JUMPER: FOR HIGH VAC INPUT CONNECT H2 TO H3, FOR LOW VAC INPUT CONNECT H1 TO H3 AND H2 TO H4

3 TB1 & TB2 ARE LOCATED ON POWER BOARD.
TB3 IS LOCATED ON CONTROL BOARD.

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER.
AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED.

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6504	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6604	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			6			
6704	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

NEXT ASSY | USED ON
APPLICATION

SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

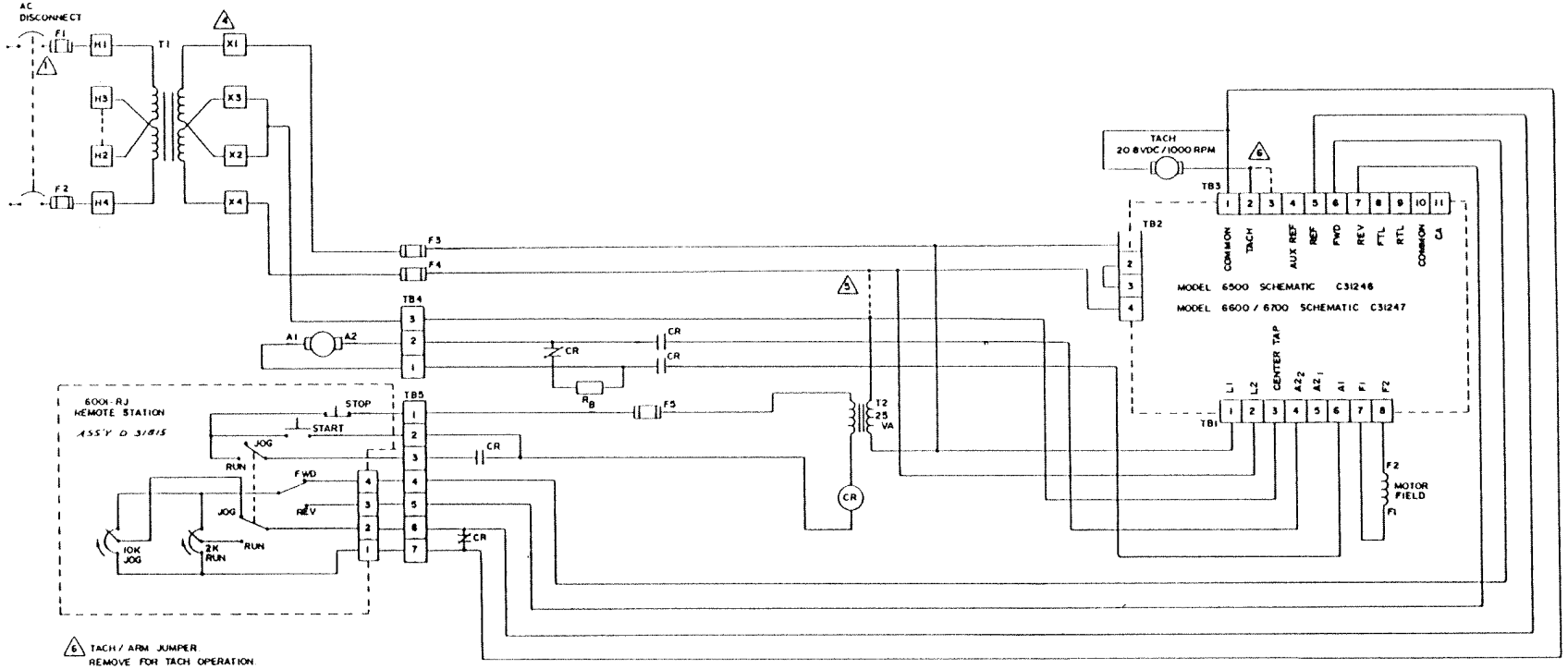
TITLE
SCHEMATIC DIAGRAM
MODEL 6504 / 6604 / 6704

DRAWN BY SWS DATE 6-8-75

SIZE D | DRAWING NO. 031270

SCALE | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISE NOTE 5	6-30-77	
	B	ADD REMOTE STATION ASS'M	12-12-77	
	C	REVISED KVA TABULATION	6-20-78	



6 TACH / ARM JUMPER.
REMOVE FOR TACH OPERATION.

5 T2 CONNECTIONS; FOR 6604-6704, CONNECT T2 PRIMARY TO F3 & TB4-3.
FOR 6504, CONNECT T2 PRIMARY TO F4 & F3.

4 T1 TERMINAL CONNECTIONS------ INDICATES JUMPER: FOR HIGH VAC INPUT, CONNECT H2 TO H3, FOR LOW VAC INPUT CONNECT H1 TO H3 & H2 TO H4.

3 TB1 & TB2 ARE LOCATED ON POWER BOARD
TB3 IS LOCATED ON CONTROL BOARD.

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER
AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6504	1/4-1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4-1	$A2_2$			3			
6604	1/2-1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2-2	$A2_2$			5			
6704	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

NEXT ASSY | USED ON | APPLICATION

MATL | FINISH

DRAWN BY SWS 7-31-75

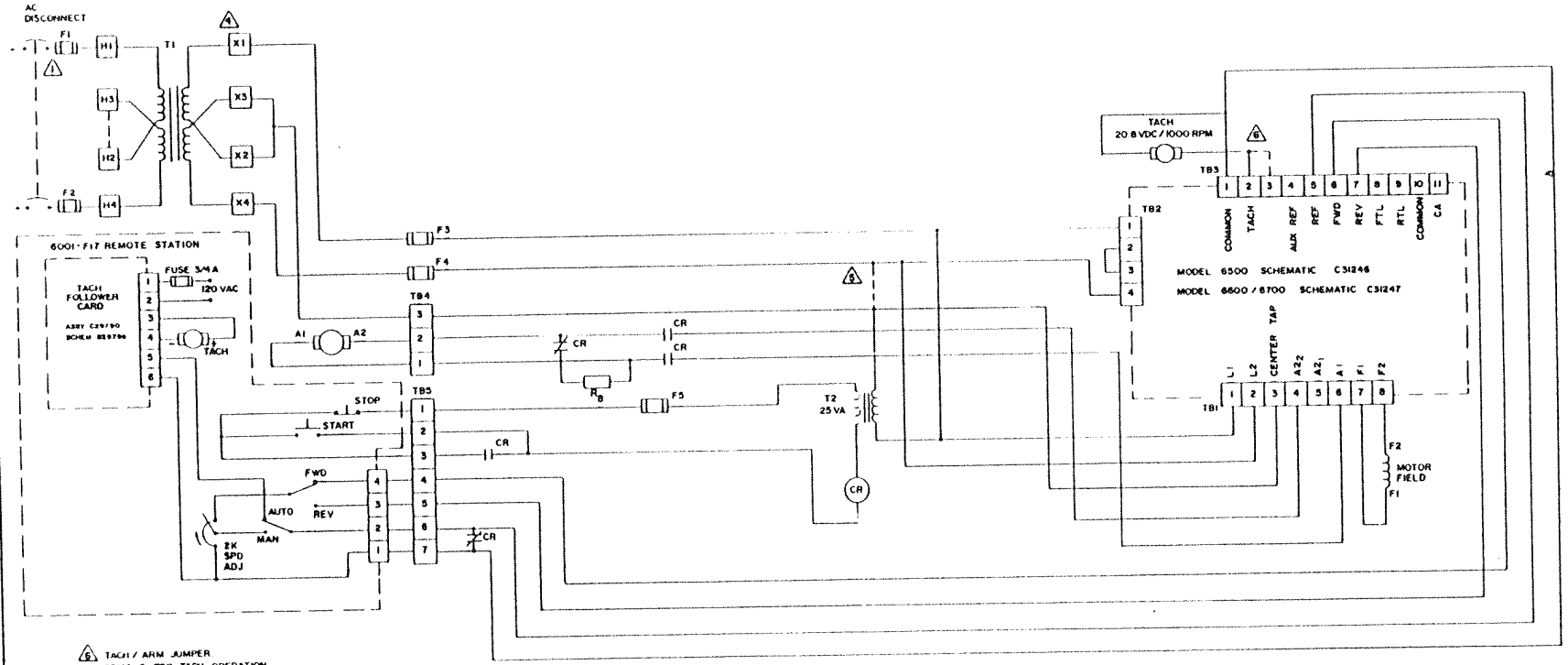
SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6504 / 6604 / 6704

SIZE D | DRAWING NO D31380

SCALE | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISED AND REDRAWN	9-2-77	VHS
	B	REVISED KVA TABULATION	9-20-78	RTC



MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6504	1/4-1/2 3/4-1	$A2_1$ $A2_2$	90	100	1.5 3	230	120	120-0-120
6604	1/2-1 1 1/2-2	$A2_1$ $A2_2$	180	200	3 5	460	230	230-0-230
6704	3 5	$A2_1$ $A2_2$	180	200	7.5 10	460	230	230-0-230

6 TACH / ARM JUMPER
REMOVE FOR TACH OPERATION.

5 T2 CONNECTIONS: FOR 6604-6704, CONNECT T2 PRIMARY TO F3 & TB4-3.
FOR 6504, CONNECT T2 PRIMARY TO F4 & F3.

4 T1 TERMINAL CONNECTIONS -------- INDICATES JUMPER: FOR HIGH VAC INPUT, CONNECT H2 TO H3
FOR LOW VAC INPUT, CONNECT H1 TO H3 & H2 TO H4.

3 TB1 & TB2 ARE LOCATED ON POWER BOARD.
TB3 IS LOCATED ON CONTROL BOARD.

2 F3, F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

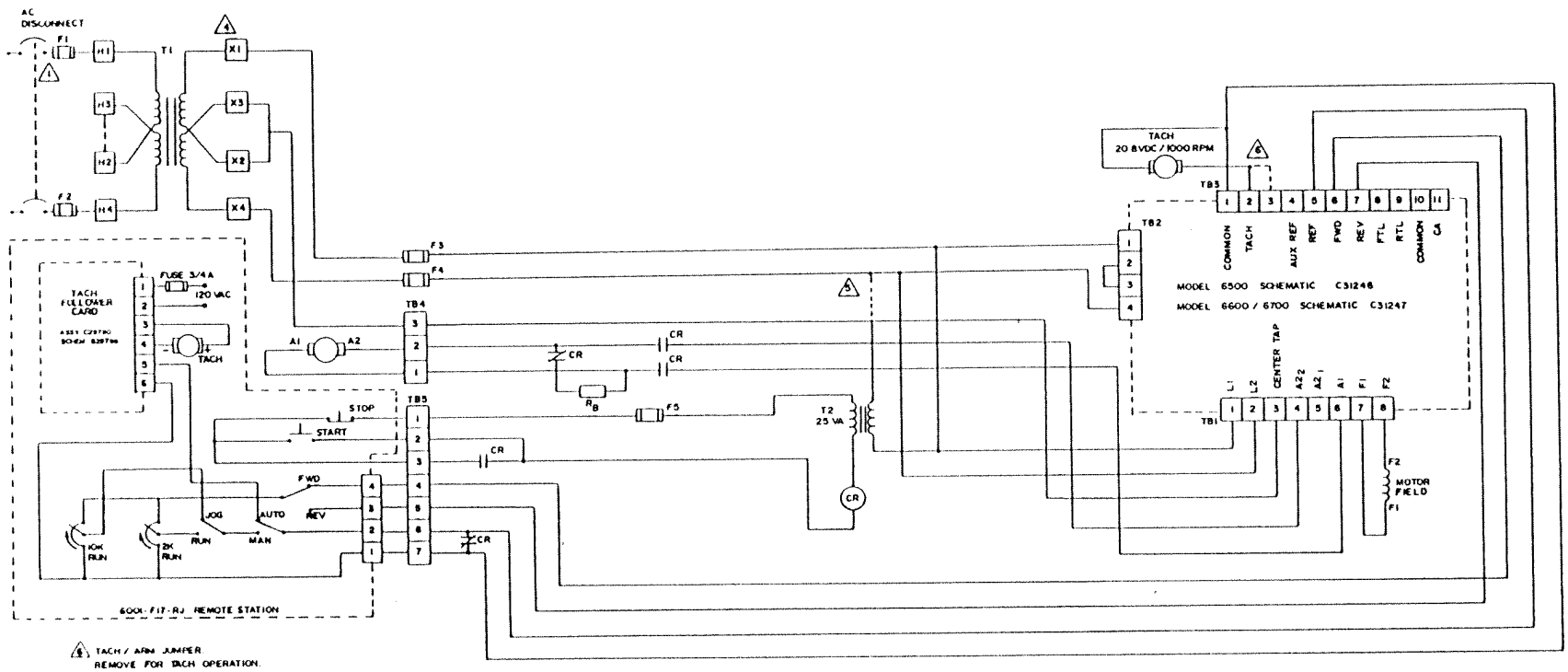
1 F1, F2 TO BE RATED PER KVA RATING OF TRANSFORMER
AC DISCONNECT & FUSES (F1-F2) ARE CUSTOMER PROVIDED

—NOTES—

QUANTITY PER ASSEMBLY	ITEM	PART NUMBER	DESCRIPTION
ASSEMBLY DASH NUMBER			
		MAT'L	BECO A DIVISION OF DANA CORP LANCASTER, S C, U S A
NEXT ASSY / USED ON APPLICATION		FINISH	TITLE: SCHEMATIC DIAGRAM MODELS 6504, 6604, 6704

DRAWN BY PYA 9-2-77
ENGINEER VHS 9-19-77
SIZE D DRAWING NO D31581
SCALE —— SHEET 1 OF 1

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	A	REVISE NOTE 5	8-30-77	
	B	REVISE KVA TABULATION	4-20-78	



4 TACH / ARM JUMPER
REMOVE FOR TACH OPERATION.

5 T2 CONNECTIONS ; FOR 6604 - 6704 , CONNECT T2 PRIMARY TO F3 & TB4-3
FOR 6504 , CONNECT T2 PRIMARY TO F4 & F3.

1 T1 TERMINAL CONNECTIONS ------- INDICATES JUMPER ; FOR HIGH VAC INPUT, CONNECT H2 TO H3 , FOR LOW VAC INPUT , CONNECT H1 TO H3 & H2 TO H4.

3 TB1 & TB2 ARE LOCATED ON POWER BOARD.
TB3 IS LOCATED ON CONTROL BOARD.

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER.
AC DISCONNECT & FUSES (F1 - F2) ARE CUSTOMER PROVIDED.

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6504	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6604	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			6			
6704	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

NEXT ASSY | USED ON
APPLICATION

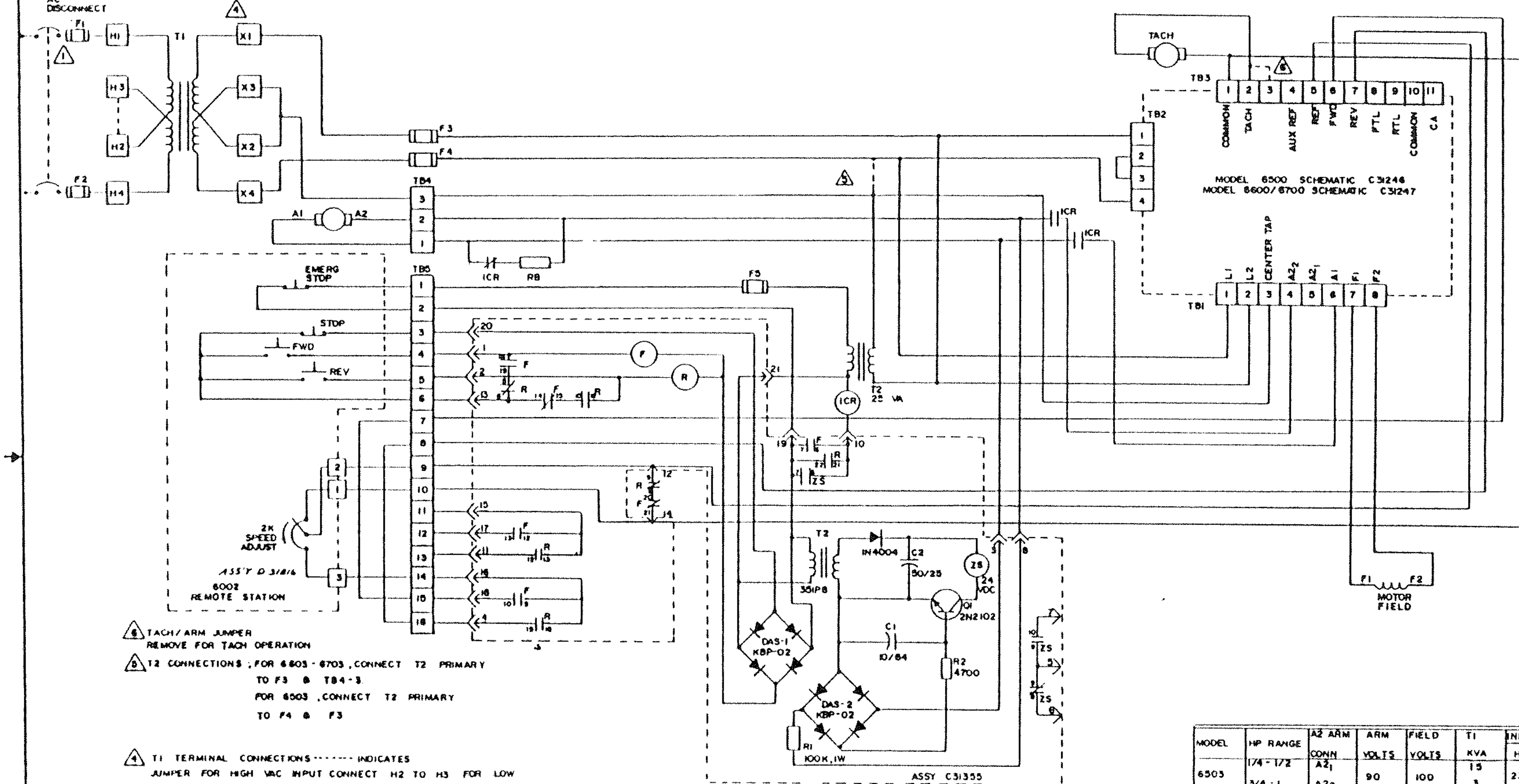
MATL
FINISH
DRAWN BY SWS
DATE 8-1-75

BECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE
SCHEMATIC DIAGRAM
MODEL 6504 / 6604 / 6704

SIZE D | DRAWING NO D31382
SCALE | SHEET

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	
	B	REVISE NOTE 5	8-30-77	MNY
	C	ADD REMOTE STA ASSY NO	11-18-77	HHS
	D	REVISE KVA TABULATION	6-20-78	RWK



6 TACH/ARM JUMPER
REMOVE FOR TACH OPERATION

5 T2 CONNECTIONS, FOR 6603-6703, CONNECT T2 PRIMARY TO F3 & TB4-3.
FOR 6503, CONNECT T2 PRIMARY TO F4 & F3

4 T1 TERMINAL CONNECTIONS - - - - - - INDICATES JUMPER FOR HIGH VAC INPUT CONNECT H2 TO H3 FOR LOW VAC INPUT CONNECT H1 TO H3 AND H2 TO H4

3 TB1 & TB2 ARE LOCATED ON POWER BOARD
TB3 IS LOCATED ON CONTROL BOARD

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER
AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED

NOTES

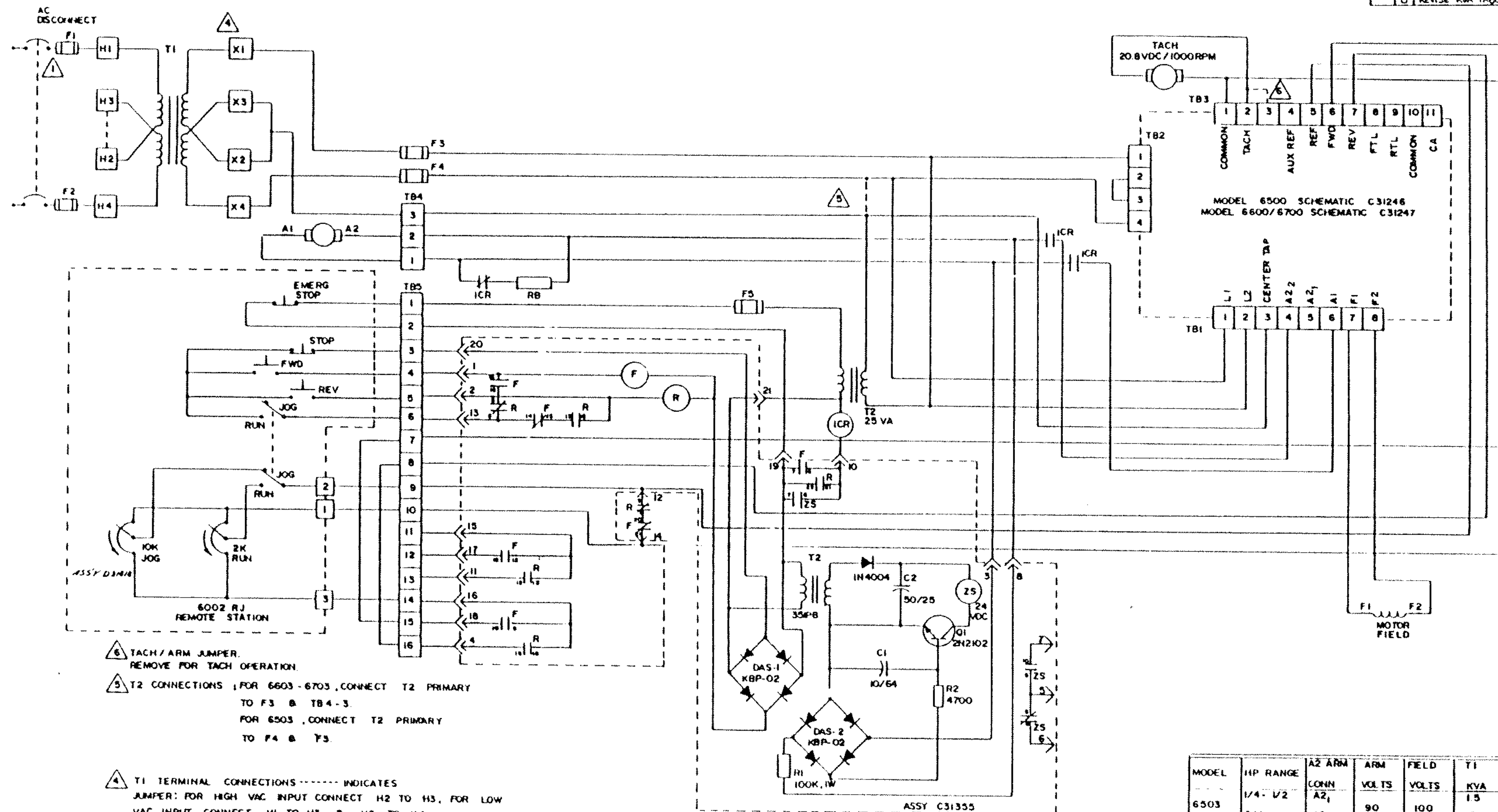
MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6503	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6603	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			5			
6703	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6503/6603/6703

DRAWN BY SWS 6-6-75 | SIZE D | DRAWING NO D31281

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	
	B	REVISE NOTE 5	8-30-77	mwj
	C	ADD REMOTE STA ASSY #	10-18-77	WNS
	D	REVISE KVA TABULATION	6-20-78	Rec



6. TACH / ARM JUMPER.
REMOVE FOR TACH OPERATION.

5. T2 CONNECTIONS ; FOR 6603 - 6703 , CONNECT T2 PRIMARY TO F3 & TB4-3.
FOR 6503 , CONNECT T2 PRIMARY TO F4 & F3.

4. T1 TERMINAL CONNECTIONS ------- INDICATES JUMPER: FOR HIGH VAC INPUT CONNECT H2 TO H3, FOR LOW VAC INPUT CONNECT H1 TO H3 & H2 TO H4.

3. TB1 & TB2 ARE LOCATED ON POWER BOARD.
TB3 IS LOCATED ON CONTROL BOARD.

2. F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1. F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER.
AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED.

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6503	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6603	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			5			
6703	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

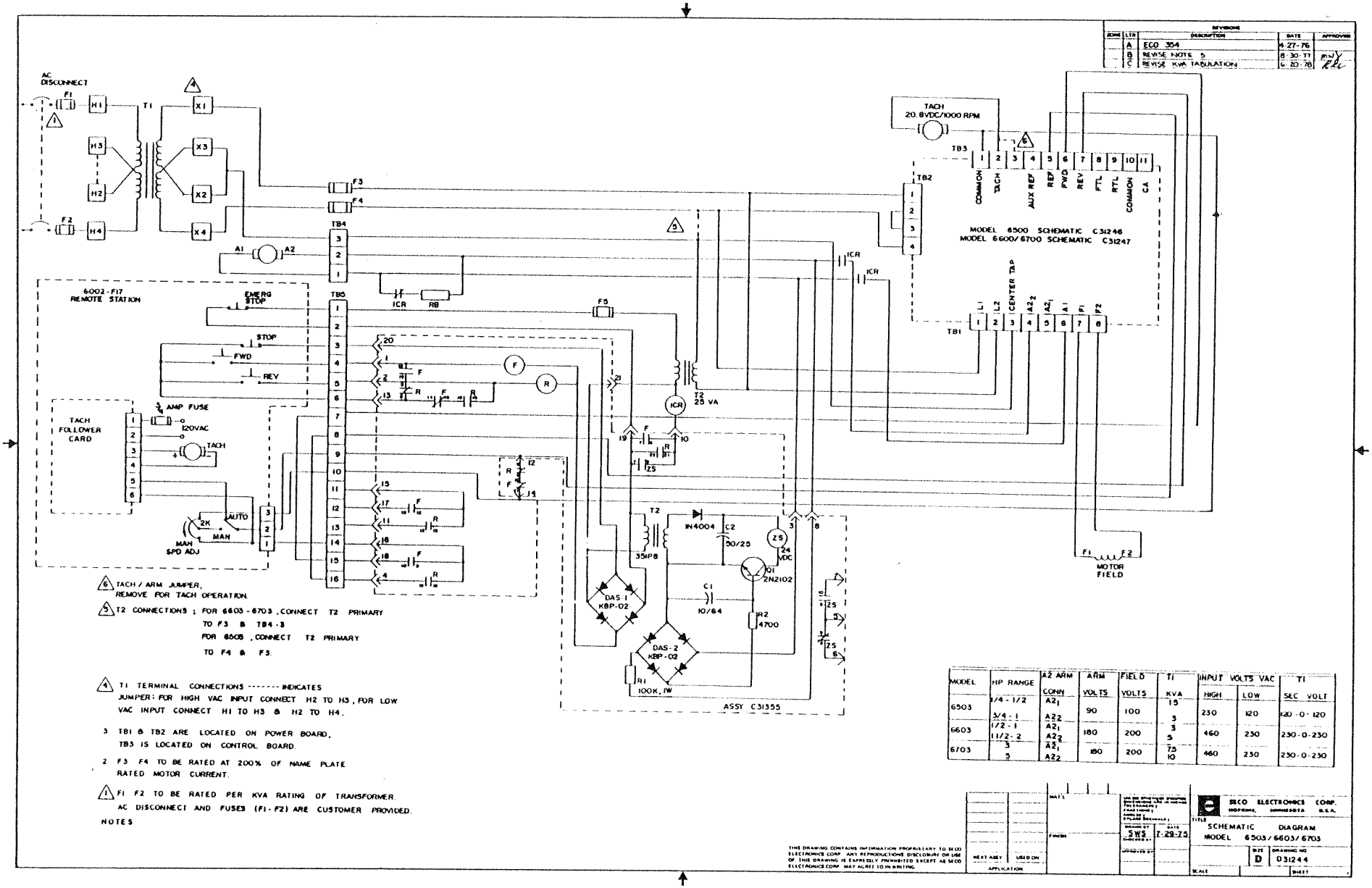
NEXT ASSY | USED ON | APPLICATION | MAT'L | FINISH

DRAWN BY SWS DATE 7-28-75 | CHECKED BY | APPROVED BY

SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6503/6603/6703

SIZE D | DRAWING NO D31243 | SCALE | SHEET



ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	
	B	REVISE NOTE 5	8-30-77	
	C	REVISE KVA TABULATION	6-20-78	

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6503	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6603	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			5			
6703	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

6 TACH / ARM JUMPER, REMOVE FOR TACH OPERATION.

5 T2 CONNECTIONS ; FOR 6603 - 6703 , CONNECT T2 PRIMARY TO F3 & TB4-3
FOR 6503 , CONNECT T2 PRIMARY TO F4 & F3.

4 T1 TERMINAL CONNECTIONS ------- INDICATES JUMPER: FOR HIGH VAC INPUT CONNECT H2 TO H3 , FOR LOW VAC INPUT CONNECT H1 TO H3 & H2 TO H4.

3 TB1 & TB2 ARE LOCATED ON POWER BOARD, TB3 IS LOCATED ON CONTROL BOARD.

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER. AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED.

NOTES

NEXT ASSY | USED ON | APPLICATION | MATL | FINISH

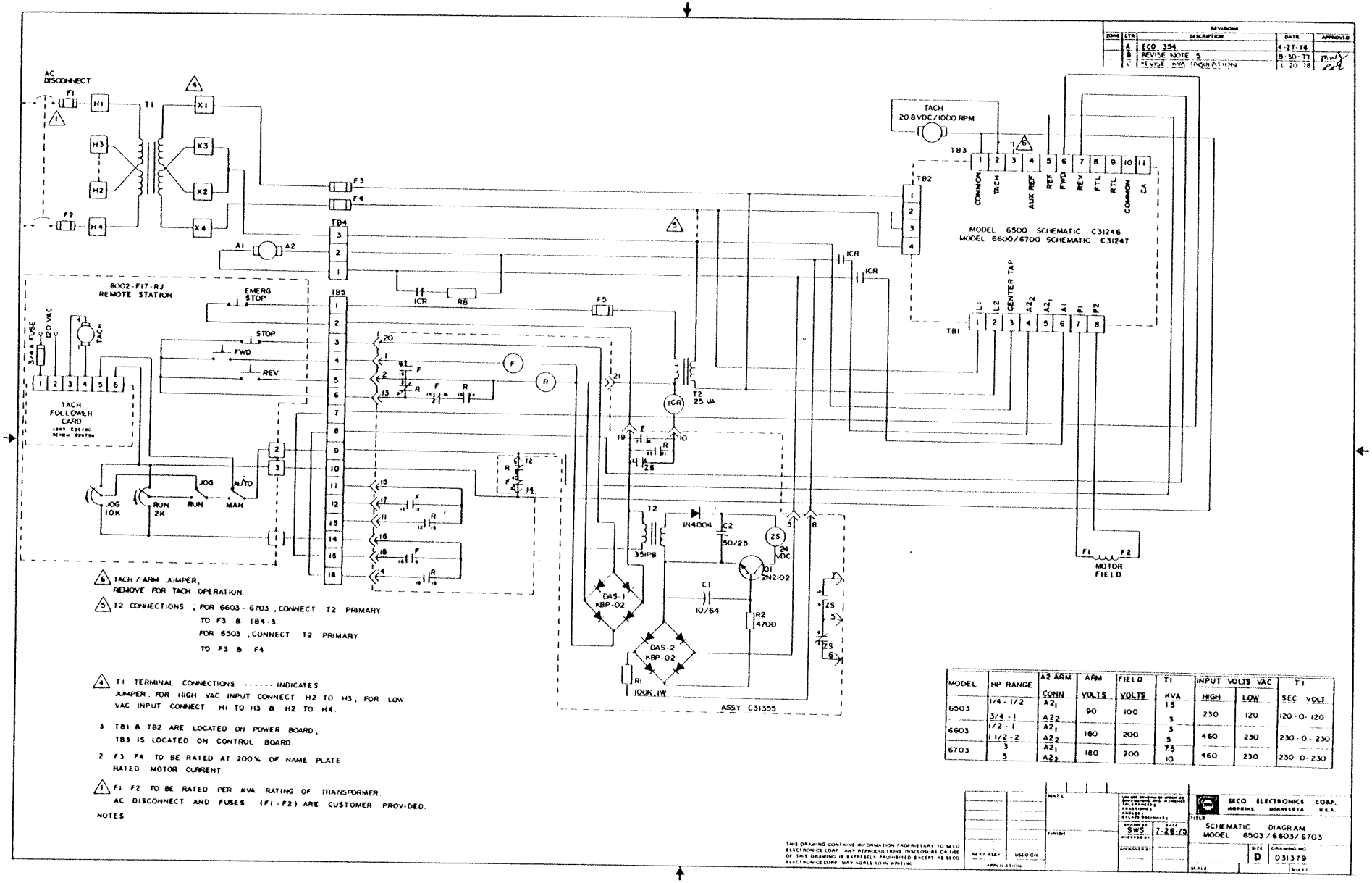
DRAWN BY SWS | DATE 7-29-75 | APPROVED BY

SECO ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6503/6603/6703

SIZE D | DRAWING NO 031244

SCALE | SHEET



6 TACH / ARM JUMPER, REMOVE FOR TACH OPERATION.

5 T2 CONNECTIONS , FOR 6603 - 6703 , CONNECT T2 PRIMARY TO F3 & TB4-3.
FOR 6503 , CONNECT T2 PRIMARY TO F3 & F4

4 T1 TERMINAL CONNECTIONS ------ INDICATES JUMPER. FOR HIGH VAC INPUT CONNECT H2 TO H3, FOR LOW VAC INPUT CONNECT H1 TO H3 & H2 TO H4.

3 TB1 & TB2 ARE LOCATED ON POWER BOARD, TB3 IS LOCATED ON CONTROL BOARD

2 F3 F4 TO BE RATED AT 200% OF NAME PLATE RATED MOTOR CURRENT.

1 F1 F2 TO BE RATED PER KVA RATING OF TRANSFORMER. AC DISCONNECT AND FUSES (F1-F2) ARE CUSTOMER PROVIDED.

NOTES

MODEL	HP RANGE	A2 ARM CONN	ARM VOLTS	FIELD VOLTS	T1 KVA	INPUT VOLTS VAC HIGH	INPUT VOLTS VAC LOW	T1 SEC VOLT
6503	1/4 - 1/2	$A2_1$	90	100	1.5	230	120	120-0-120
	3/4 - 1	$A2_2$			3			
6603	1/2 - 1	$A2_1$	180	200	3	460	230	230-0-230
	1 1/2 - 2	$A2_2$			5			
6703	3	$A2_1$	180	200	7.5	460	230	230-0-230
	5	$A2_2$			10			

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	
	B	REVISE NOTE 5	8-30-77	
	C	REVISE KVA TABULATION	6-20-78	

NEXT ASSY | USED ON | APPLICATION

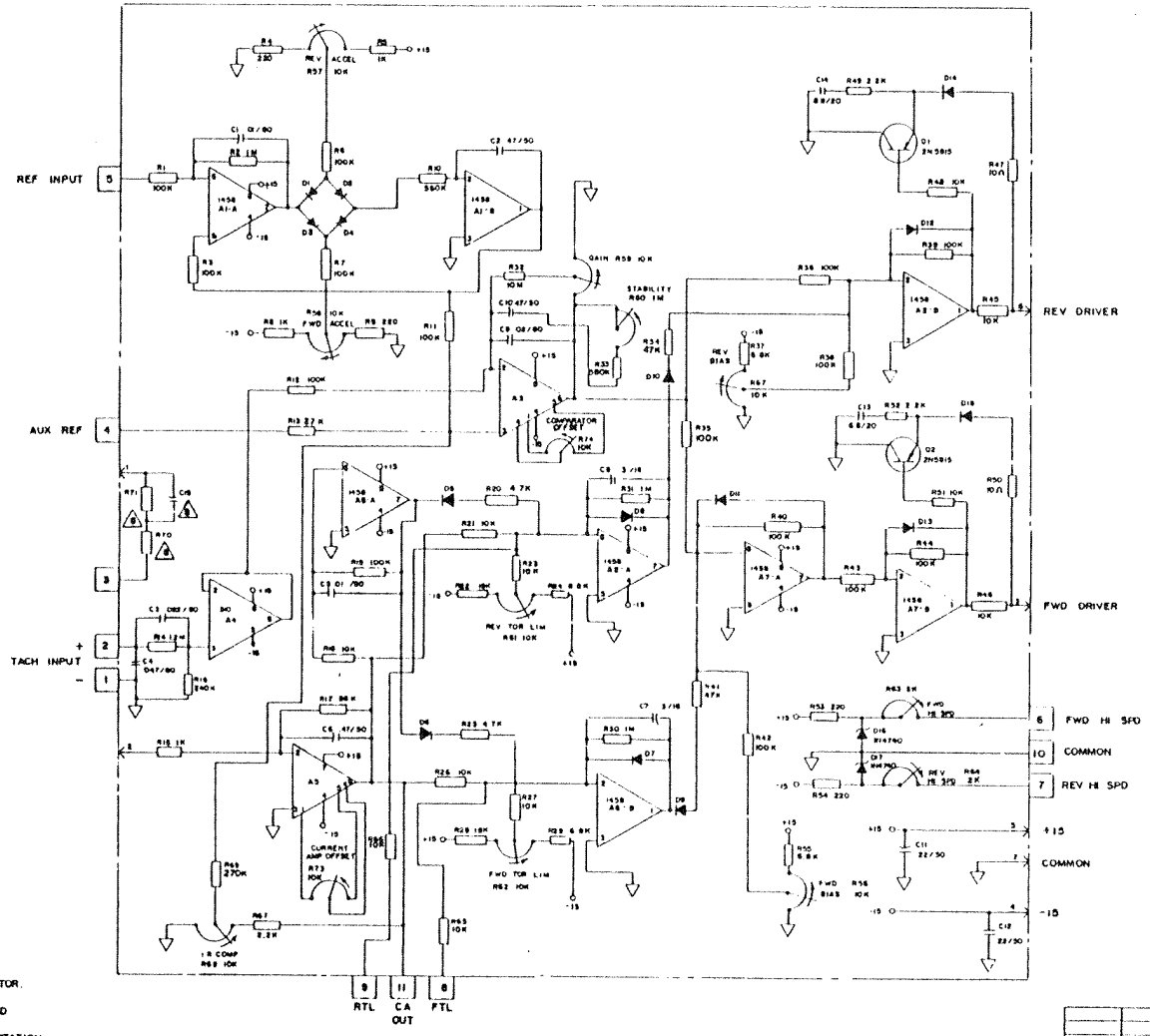
MATL | FINISH

DRAWN SWS 7-28-75 | CHECKED | APPROVED

SECO ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAGRAM MODEL 6503/6603/6703

SIZE D | DRAWING NO D31379 | SCALE | SHEET



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 382	11-29-76	
	B	REMOVE OFFSET POTS & CORRECT OP AMP PIN NOS.	4-5-77	
	C	ECO 410	7-14-77	
	D	ECO 426	9-2-77	
	E	ADD COMPARATOR OFFSET POT	9-2-77	

TABULATION		
PART NO	ASSY -00 VALUE	ASSY -01 VALUE
R70	3.9M	2.2M
R71	3.3M	560K
C18	.047	.22

NOTES
1. ALL RESISTORS 0.5 WATT, 10%
2. ALL CAPACITOR VALUES IN MFD/WVDC
3. ARROWS ON POTS INDICATE CW ROTATION
4. NC (NO CONNECTION)
5. ALL DIODES IN4004 UNLESS NOTED
6. ☐ DENOTES TBS
7. ⟨ DENOTES CARD EDGE CONNECTOR.
8. ⚠ SEE TABLE

NEXT ASSY APPLICATION	USED ON
	6700
	6600
	6500

MATL
FINISH PC BD D31285
ASSY D31286

DRAWN	SWS	7-11-75
CHECKED		
ENGR APPR		
MFG APPR		

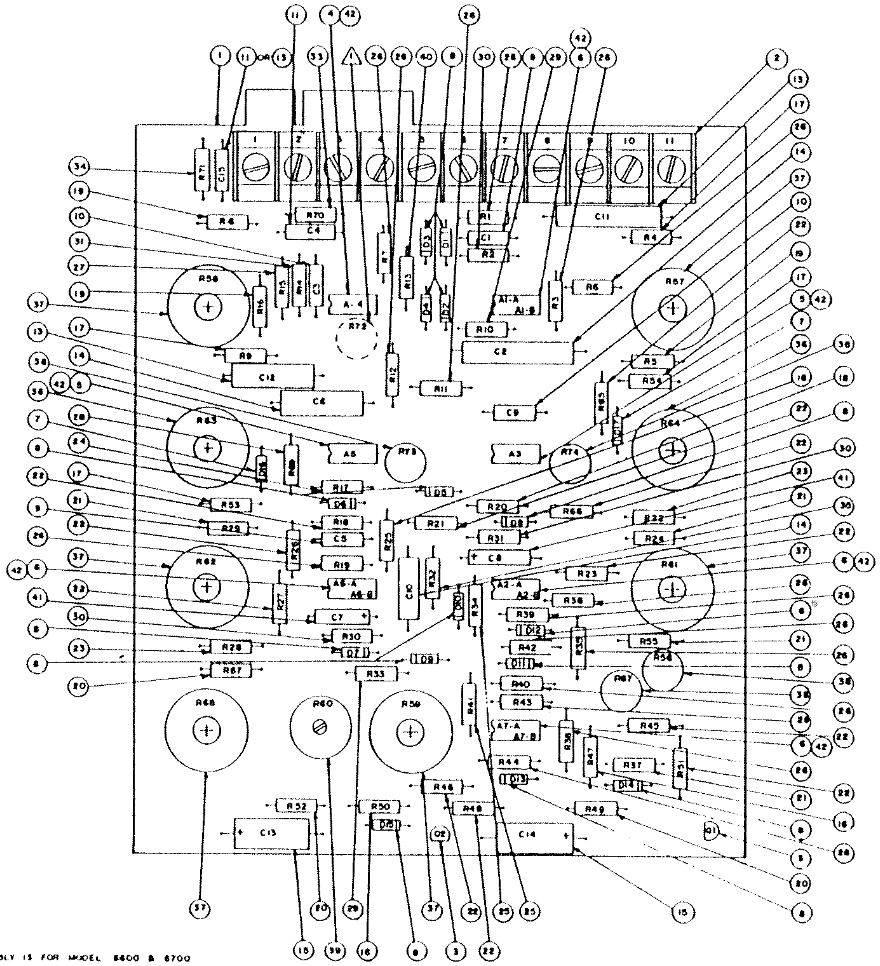
SECO ELECTRONICS CORP. MINNEAPOLIS, MINNESOTA U.S.A.

TITLE SCHEMATIC CONTROL BOARD MODEL 6500

SIZE D DRAWING NO D31284

SCALE — SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADDED ITEM # 42	7 26 76	
	B	ECO 383	11-29-76	
	C	ECO 410	1-14-77	
	D	ECO 426	9-2-77	
	E	ADD R34; CHG TO 1/4W, 5% (ECO 433) RESISTORS, REVISE PER NEW PART NOS.	10-5-77	
	F	CHG. PART # ITEM 1 (REV. B)	9-26-77	
	G	ECO #36		



NOTES

2. -00 ASSEMBLY IS FOR MODEL 6600 & 6700
-01 ASSEMBLY IS FOR MODEL 6500

⚠ POT R72 IS OPTIONAL IF USED, PART NO IS APT1022-01

QTY/ASSY -01	QTY/ASSY -00	ITEM	PART NO	DESCRIPTION
7	7	42	HWA1116-00	SOCKET, I.C.
1		34		RESISTOR, 560K, 1/4W, 5%
1		33	PRE1033-44	RESISTOR, 2.2M, 1/4W, 5%
2	2	41	PCA2015-01	CAPACITOR, 3/16
1	1	40	PRE1004-49	RESISTOR 2.7K 1/4W 5%
1	1	39	APT 1002-01	POT, 1M
4	4	38	APT 1022-01	POT, 10K
6	6	37	APT 1007-03	POT, 10K
2	2	36	APT 1007-02	POT, 2K
1	1	35	PRE 1033-60	RESISTOR, 10M, 1/4W 5%
	1	34	PRE 1033-48	RESISTOR, 3.3M, 1/4W 5%
	1	33	PRE 1033-50	RESISTOR, 3.9M, 1/4W 5%
		32		
1	1	31	PRE 1033-38	RESISTOR, 1.2M, 1/4W 5%
3	3	30	PRE 1033-36	RESISTOR, 1M, 1/4W 5%
2	2	29	PRE 1033-30	RESISTOR, 560K, 1/4W 5%
1	1	28	PRE 1033-22	RESISTOR, 270K, 1/4W 5%
1	1	27	PRE 1033-21	RESISTOR, 240K, 1/4W 5%
16	16	26	PRE 1033-12	RESISTOR, 100K, 1/4W 5%
2	2	25	PRE 1033-04	RESISTOR, 47K, 1/4W 5%
1	1	24	PRE 1033-06	RESISTOR, 56K, 1/4W 5%
2	2	23	PRE 1001-93	RESISTOR, 18K, 1/4W 5%
11	11	22	PRE 1001-87	RESISTOR, 10K, 1/4W 5%
4	4	21	PRE 1001-83	RESISTOR, 6.8K, 1/4W 5%
3	3	20	PRE 1001-71	RESISTOR, 2.2K, 1/4W 5%
3	3	19	PRE 1001-63	RESISTOR, 1K, 1/4W 5%
2	2	18	PRE 1001-79	RESISTOR, 4.7K, 1/4W 5%
4	4	17	PRE 1001-47	RESISTOR, 220Ω, 1/4W 5%
2	2	16	PRE 1001-15	RESISTOR, 10Ω, 1/4W 5%
2	2	15	PCA2012-01	CAPACITOR, 6.8 µ/20 VDC TANTALUM
3	3	14	PCA1010-02	CAPACITOR, .47/50
3	2	13	PCA1010-01	CAPACITOR, .22/50
		12		
1	2	11	PCA1011-03	CAPACITOR, .047/80
2	2	10	PCA1011-02	CAPACITOR, .022/80
2	2	9	PCA1011-01	CAPACITOR, .01/80
15	15	8	PD11006-00	DIODE, 1N4004
2	2	7	PD13004-00	DIODE, 1N4740
4	4	6	AIC1003-00	OP AMP, 1458
2	2	5	AIC1006-00	OP AMP, 741
1	1	4	AIC1009-00	OP AMP, 310
2	2	3	ATR2004-00	TRANSISTOR, 2N5815
1	1	2	HWA2007-11	TERMINAL STRIP, 11 POS
1	1	1	PCBD31285B	PC BOARD

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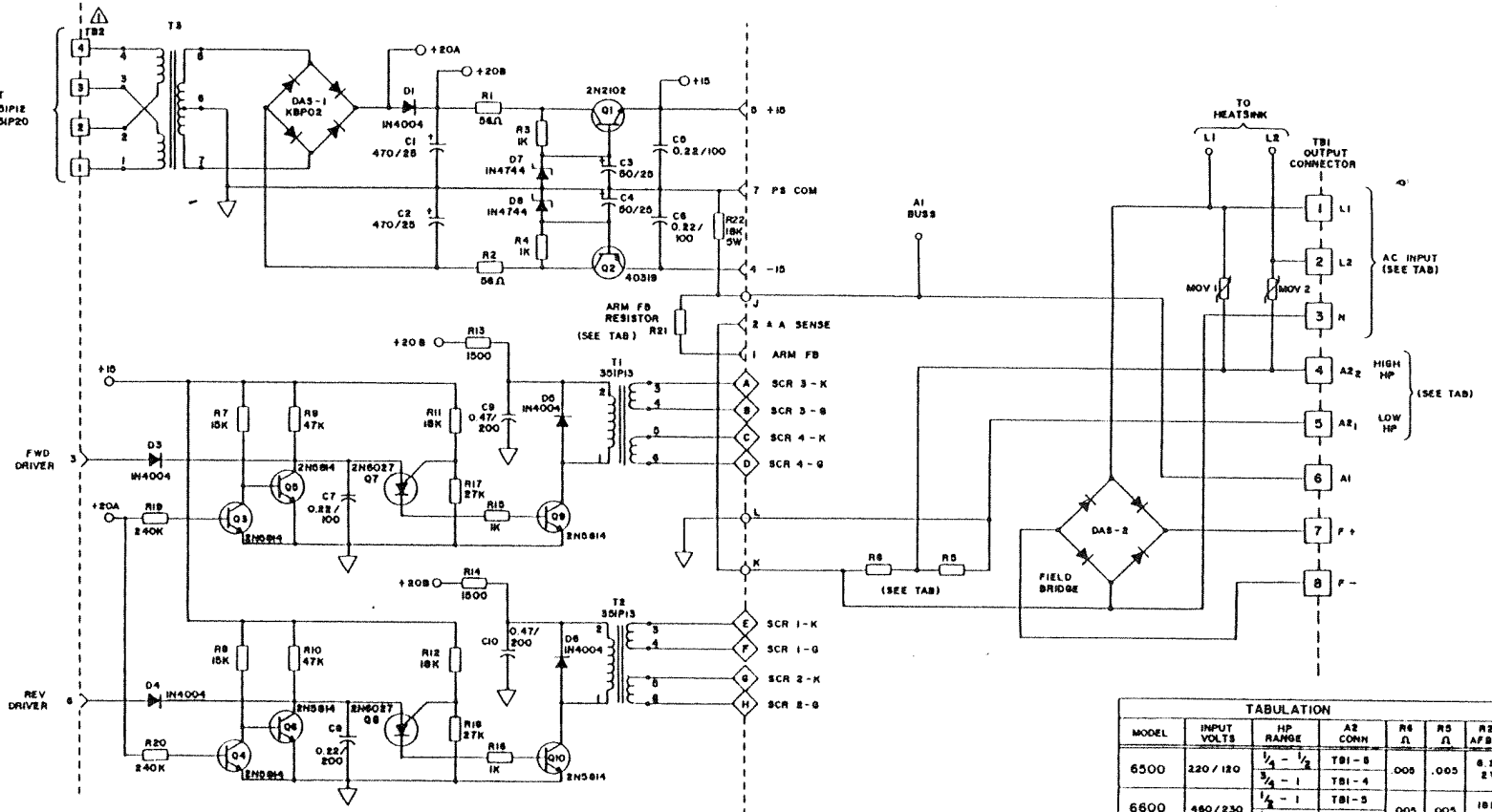
SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE: ASSEMBLY, CONTROL BOARD, 6000 SERIES

DRAWN: SWS 6-6-75 CHECKED: RGC 6-17-75

SIZE: D DRAWING NO: D31286

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 392	2-2-77	
	B	ECO 426	9-2-77	



TABULATION

MODEL	INPUT VOLTS	HP RANGE	A2 CONN	R6 Ω	R5 Ω	R21 AFB Ω
6500	220/120	1/4 - 1/2	TB1-5	.005	.005	6.2K 2W
		3/4 - 1	TB1-4			
6600	460/230	1/4 - 1	TB1-5	.005	.005	18K 5W
		1 1/2 - 2	TB1-4			
6700	460/230	3	TB1-5	.002	.0013	18K 5W
		5	TB1-4			

8. TERMINAL IDENTIFICATION
   - ○ SOLDER HOLES
   - ◇ PC BOARD QUICK CONNECTS
   - □ BARRIER STRIP, SCREW TYPE
   -) PC/BOARD CONNECTOR

⚠ FOR HIGH VAC OPERATION CONNECT TB2-2 TO TB2-3
FOR LOW VAC OPERATION CONNECT TB2-4 TO TB2-3
AND TB2-1 TO TB2-2.

NOTES:

NEXT ASSY | USED ON | APPLICATION

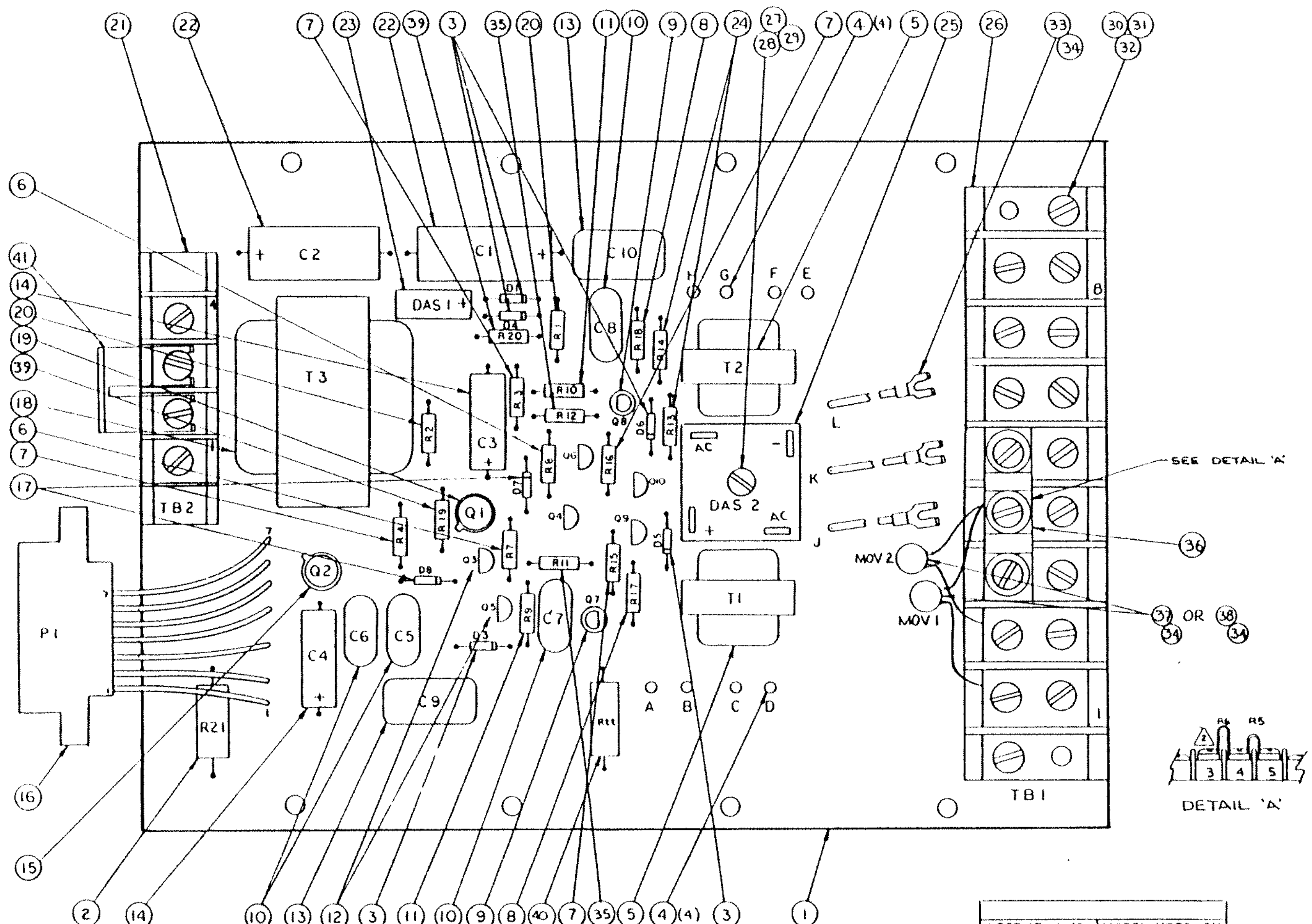
DRAWN BY HAP 2-16-78

SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE SCHEMATIC DIAG, POWER BOARD, MODEL 6500-6700

SIZE D | DRAWING NO 031399

SCALE NONE | SHEET



ASSEMBLY NO.	MODEL USED ON
D29665-01	5500, 6500
D29665-02	5600, 6600
D29665-03	5700, 6700

⚠2 R6 ON -01 & -02 IS SHOWN DOTTED.

⚠1 R22 (ITEM 40) IS USED ONLY ON THE 6000 SERIES POWER BD. THE 5000 SERIES POWER BD. HAS NOTHING AT THIS LOCATION.

NOTES

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 292	2-0-2-73	
	B	ECO #40	7/29/76	RGC
	C	ECO 398	2-2-77	
	D	CORRECT PART # ON ITEMS 36-37	5-2-77	
	E	CORRECT TRANSISTORS Q3,4,5,6,7,10	[illegible]	
	F	ECO 426	9-6-77	WNS
	G	ADD ITEM 41, REVISE DETAIL 'A'	9-6-77	WNS
	H	ECO #75	12-21-77	

QTY/ASSY 03	QTY/ASSY 02	QTY/ASSY 01	ITEM	PART NO.	DESCRIPTION
2	2	2	41	HWA2002-00	JUMPER, TERMINAL
1	1	1	40	PPE1007-00	RESISTOR, 18K, 5W ⚠1
2	2	2	39	PPE1033-21	RESISTOR, 140 K, 5%
2	2	/	38	FSI2002-00	MOV, VP250A10
/	/	2	37	FSU2003-00	MOV, VP130A10
1	/	/	36	PPE2006-00	.002/.0033 IR COMP
/	1	1	36	PPE2014-00	.005/.010 IR COMP
2	2	2	35	PPE1001-93	18K
7	7	/	34		TERMINAL,
3	3	/	33		WIRE,
/	/	7	34		TERMINAL,
/	/	3	33		WIRE
/	/	1	18	PTR4005-00	TRANSFORMER, POWER 351P12
2	2	/	32	—	NUT, HEX, 8-32
2	2	/	31	—	WASHER, LOCK, INT, NO.8
2	2	/	30	—	SCREW, 8-32X⅝ BD HD
/	/	2	32	—	NUT, HEX, 6-32
/	/	2	31	—	WASHER, LOCK, INT, NO.6
/	/	2	30	—	SCREW
1	1	1	29	—	NUT, HEX, 6-32
1	1	1	28	—	WASHER, LOCK, INT, NO. 6
1	1	1	27	—	SCREW, 6-32 X ¼ BD HD
1	1	1	26	HWA2021-07	TERMINAL BLOCK, 8 POS.
1	1	1	25	PDI5005-00	BRIDGE, 6N860
2	2	2	24	PPE1001-47	RESISTOR, 1.5K
1	1	1	23	PDI5001-00	BRIDGE, KBP02
2	2	2	22	PCA2008-04	CAPACITOR, 470/25
1	1	1	21	HWA2009-01	TERMINAL BLOCK, 4 POSTION
2	2	2	20	PPE1001-33	RESISTOR, 56 Ω
1	1	1	19	ATR1001-00	TRANSISTOR, 2N2102
1	1	/	18	PTR4014-00	TRANFORMER, POWER, 351P20
2	2	2	17	PDI3001-00	DIODE, 1N4744
1	1	1	16	B29670	PLUG ASSY
1	1	1	15	ATR2001-00	TRANSISTOR, 40319
2	2	2	14	PCA2019-00	CAPACITOR, 50/25
2	2	2	13	PCA1008-01	CAPACITOR, .47/100
6	6	6	12	ATR1009-00	TRANSISTOR, 2N5814
2	2	2	11	PRE1033-09	RESISTOR, 47K
4	4	4	10	PCA1005-02	CAPACITOR, .22/100
2	2	2	9	ATR4001-00	TRANSISTOR, 2N6027
2	2	2	8	PRE1001-97	RESISTOR, 27K
4	4	4	7	PPE1001-63	RESISTOR, 1K
2	2	2	6	PRE1001-91	RESISTOR, 15K
2	2	2	5	PTR2001-00	TRANSFORMER, 351P13
8	8	8	4	HWA1014-00	CONNECTOR, MALE, AMP
5	5	5	3	PDI1006-00	DIODE, 1N4004
1	1	/	2	PRE1007-00	RESISTOR, 18K, 5W
/	/	1	2	PRE1002-43	RESISTOR, 8.2K, 2W
1	1	1	1	PCBD29643B	P C BOARD
ASSY-NO. 03	02	01	ITEM	PART NO.	DESCRIPTION

D31372 — NEXT ASSY / USED ON — APPLICATION

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SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

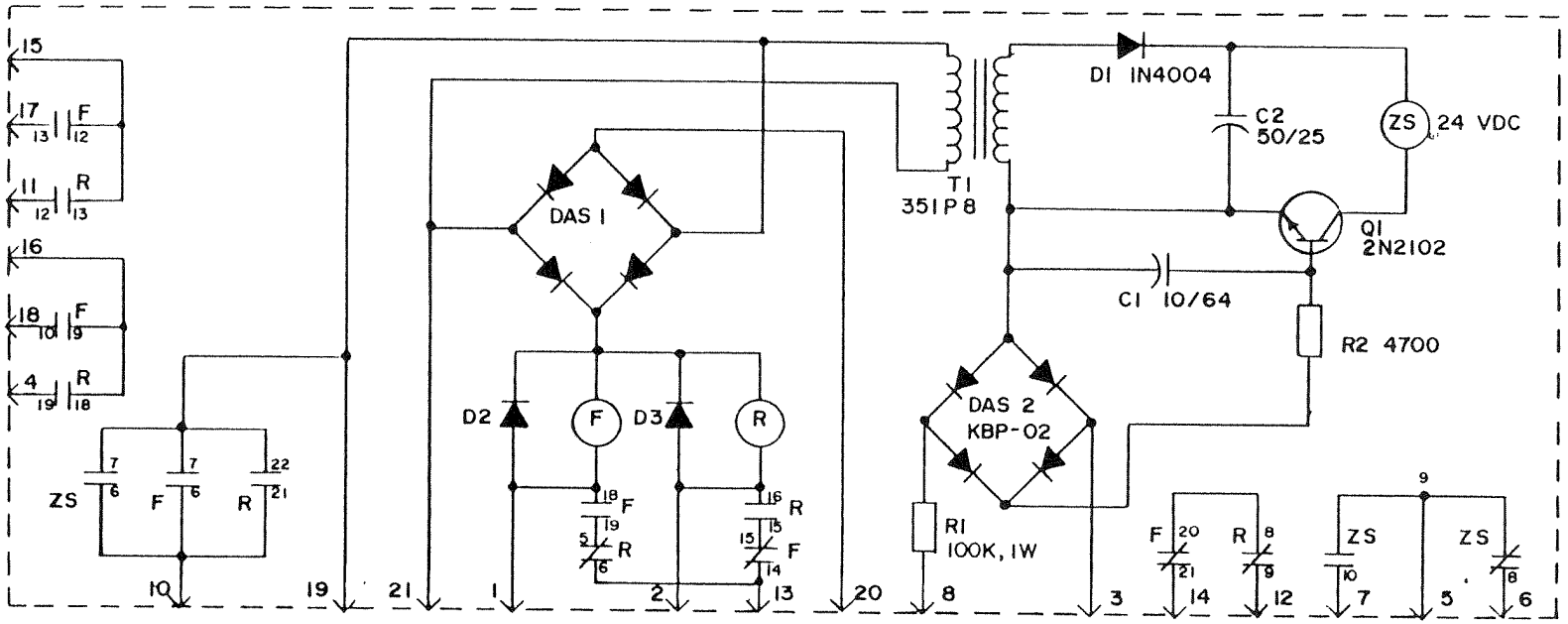
DRAWN BY GC DATE 1-10-72

TITLE POWER BOARD FOR 5000 & 6000 SERIES

SIZE D DRAWING NO D29665

SCALE 2:1 SHEET 1 of 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	



		MAT'L	
		FINISH	
NEXT ASSY	USED ON		
APPLICATION			

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

DRAWN BY	DATE
SWS	7-8-75
CHECKED BY	
APPROVED BY	

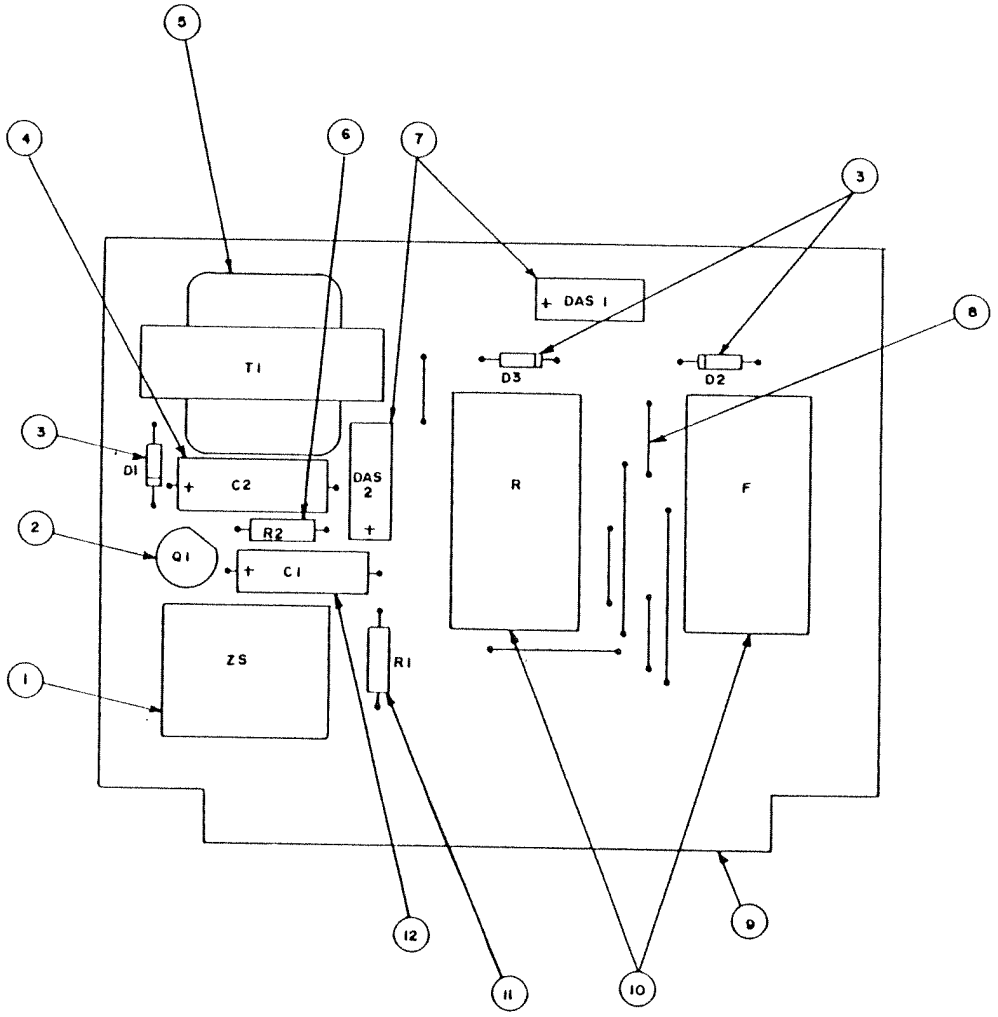
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE
SCHEM - ZERO SPEED
SENSING CARD

SIZE	DRAWING NO.
B	B31356

SCALE | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 354	4-27-76	
	B	REVISED PER NEW SPEC. NOS.	2-21-77	SWS



QTY / ASSY	ITEM	PART NO	DESCRIPTION
	1	PCA2010-05	CAPACITOR , 10 / 64
1	11	PRE1003-57	RESISTOR, 100K, 1W
2	10	~~ARE1003-00~~ ARE1006-00	RELAY , 6PDT 1009
1	9	D31354	PC BOARD
4	8	——	JUMPER
2	7	PDI5001-00	BRIDGE , KBP02
1	6	PRE1001-79	RESISTOR , 470Ω
1	5	RTR4001-00	TRANSFORMER , 351P8
1	4	PCA2015-00	CAPACITOR , 50/25
3	3	PDI1006-00	DIODE , IN4004
1	2	ATR1001-00	TRANSISTOR , 2N2102
1	1	ARE1002-00	RELAY , 2PDT ARE 1012-00

ASSY DASH 01

L REF SCHEMATIC B31356

NOTES

NEXT ASSY	USED ON
APPLICATION	

MAT'L

FINISH

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

DRAWN BY	DATE
SWS	7-24-75
CHECKED BY	
APPROVED BY	

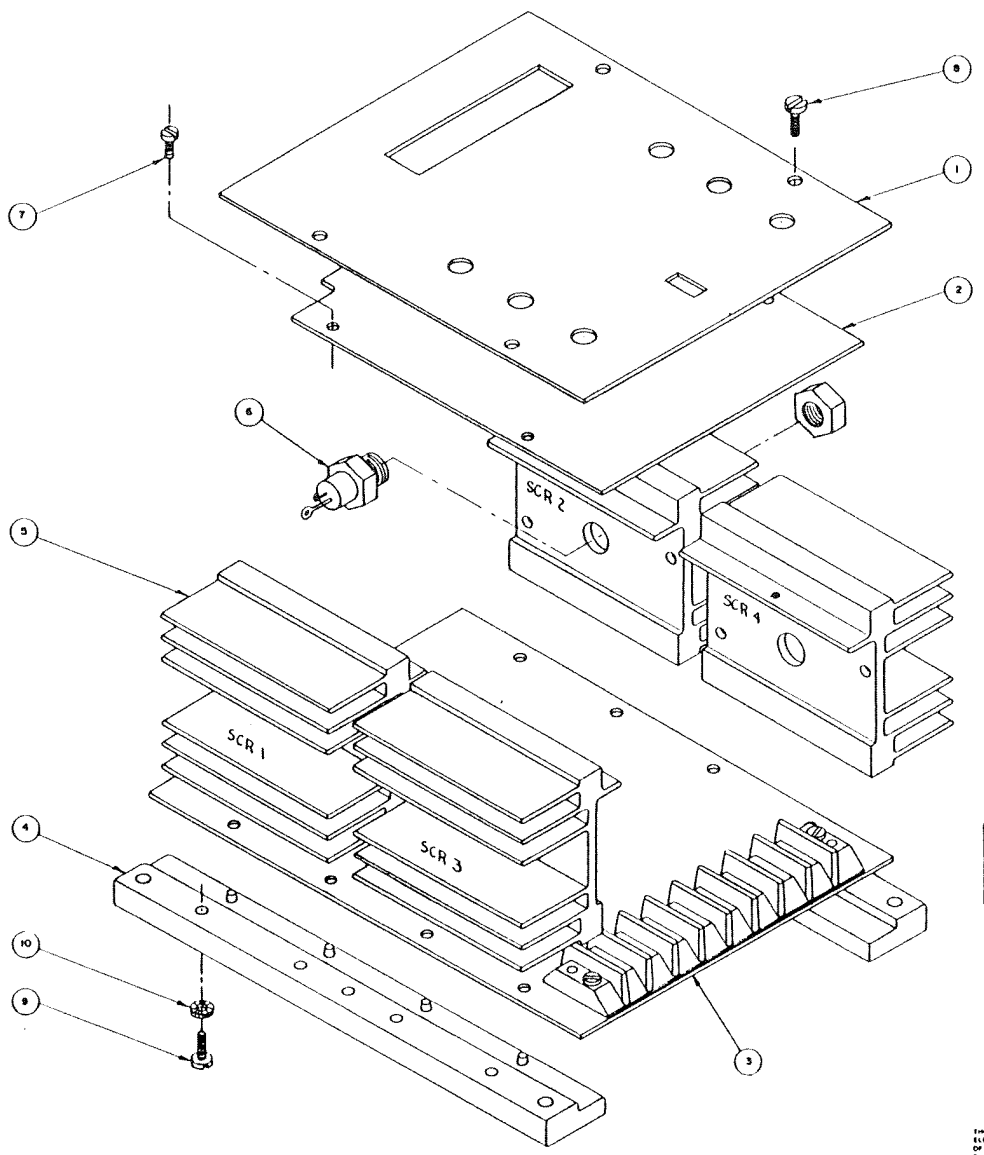
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE
ZERO SPEED SENSING CARD ASSY, 6000 SERIES

SIZE	DRAWING NO.
C	C31355

SCALE SHEET

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECO 371 CHANGED ITEM 8	8-26-74	AHU
	B	REVISE ITEM 1 PER VIEW "B"	6-30-77	



TABULATION			
DASH NO	MODEL NO	HP	INPUT VOLTAGE
01	6500	1/2 - 1	230 - 120
02	6600	1/2 - 2	460 - 230
03	6700	3 - 5	460 - 230

ASSY DASH 03	ASSY DASH 02	ASSY DASH 01	ITEM NO.	PART NO.	DESCRIPTION
0	0	0	10	———	WASHER LOCK, EXT. NO. 8
0	0	0	9	———	SCREW, 8-32 X 3/8
4	4	4	8	———	SCREW, 8-32 X 3/8
4	4	4	7	———	SCREW, 8-32 X 1/4
2	2		6	ATV1019-20	WITH OPTION (SCR) GE C48PB2X1
		4	6	ATV1032	SCR, CINV MX15
4	4		5	HHS2013-02	HEAT SINK
		4	5	HHS2013-01	HEAT SINK
2	2	2	4	C29963	FOOT, MOUNTING
1			3	D29665031	PCB ASSY POWER
	1		3	D29665021	PCB ASSY POWER
		1	3	D29665011	PCB ASSY POWER
1	1	1	2	D31286	PCB ASSY CONTROL
1	1	1	1	FITA32095	SCREENED FRONT COVER

NEXT ASSY | USED ON | APPLICATION

MATL | FINISH

SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

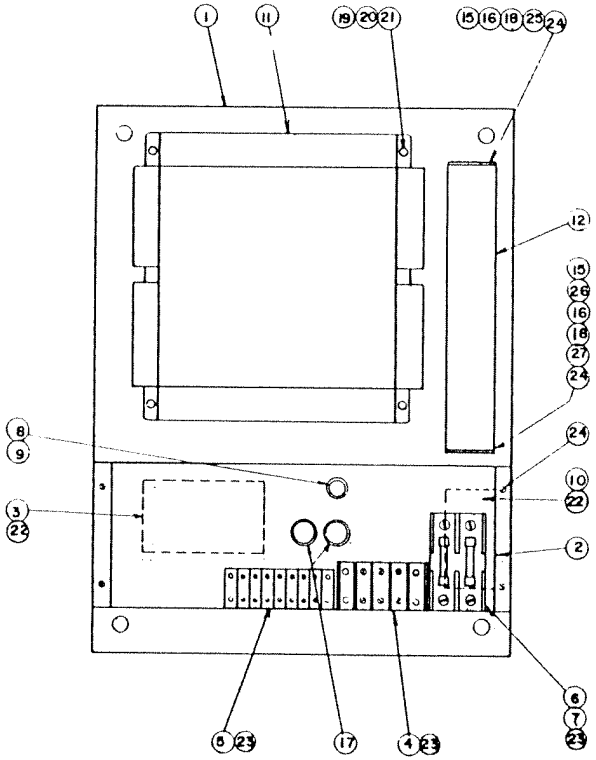
TITLE: FINAL ASSY, 6500, 6600, 6700

DRAWN BY: SWS 8-4-73

SIZE D | DRAWING NO D31372

SCALE 1:1 | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADD ITEM 28.	5-20-76	
	B	COMBINE HP RANGES FOR 6504, 6604 & 6704. UPDATE PART NOS.	9-1-77	
	C	ECO 428	9-9-77	
	D	CORRECT ITEM #2	2-16-78	



MODEL	HP RANGE	ASSY DASH NO
6504	1/4 - 1	01
6604	1/2 - 2	02
6704	3 - 5	03

QTY./ASSY. 03	02	01	ITEM	PART NO	DESCRIPTION
1	1	1	28	ARE4009-01	AUX CONTACT
1	1	1	27	HNB3004-00	WASHER, LOCKING, STAR, EXT, 1/4
1	1	1	26	HNB2007-00	NUT, HEX, 1/4-20, UNC-2B
1	1	1	25	HNB1006-00	BOLT, HEX, 1/4-20, UNC-2A x 9/4
8	8	8	24	———	SCREW, BD HD, 8-32, UNC-2A x 1/4
10	10	10	23	———	SCREW, BD HD, 8-32, UNC-2A x 5/8
6	6	6	22	———	SCREW, BD HD, 8-32, UNC-2A x 3/8
4	4	4	21	———	WASHER, LOCKING, STAR, EXT NO 8
4	4	4	20	———	NUT, HEX, 8-32, UNC-2B
4	4	4	19	———	SCREW, BD HD, 8-32, UNC-2A x 3/4
2	2	2	18	HNB 3001-01	WASHER, MICA
2	2	2	17	HFA 2001-04	BUSHING, HEYCO
2	2	2	16	HNB 3002-01	WASHER, CENTERING METAL
2	2	2	15	FBRA32236A	MOUNTING BRACKET RES.
1			14	HLA1040-00	STICKER, MODEL NO 6704
	1		14	HLA1040-05	STICKER, MODEL NO 6604
		1	14	HLA1040-04	STICKER, MODEL NO 6504
1	1	1	13	HLA1017-00	TAG, SERIAL NO.
1	1	1	12	PRE 2005-01	BRAKE RESISTOR 9 OHM 300W
1			11	D31372-3	6700 MODULE
	1		11	D31372-2	6600 MODULE
		1	11	D31372-1	6500 MODULE
1	1	1	10	PTR 1001-00	TRANSFORMER
1	1	1	9	PFU1004-03	FUSE, 1 AMP, AGC
1	1	1	8	PFU 2008-00	FUSE HOLDER
2			7	PFU1005-07	FUSE, 50 AMP, SC
	2		7	PFU1005-06	FUSE, 30 AMP, SC
		2	7	PFU 1005-05	FUSE, 20 AMP, SC
1			6	PFU 2027-00	FUSE HOLDER BUSS 2920
	1	1	6	PFU 2026-00	FUSE HOLDER BUSS 2919
1	1	1	5	HWA 2031-02	TERMINAL STRIP 7 POS.
1	1	1	4	HWA 2032-00	TERMINAL STRIP 3 POS.
1	1	1	3	ARE 4007-00	CONTACTOR
1	1	1	2	FBRA32595A	BRACKET, SCREENED
1	1	1	1	FCHC29672B	CHASSIS

ASSY DASH NO.

NEXT ASSY USED ON: 6704, 6604, 6504

APPLICATION

MAT'L

FINISH

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

DRAWN BY RGC DATE 7-30-75

CHECKED BY

APPROVED BY

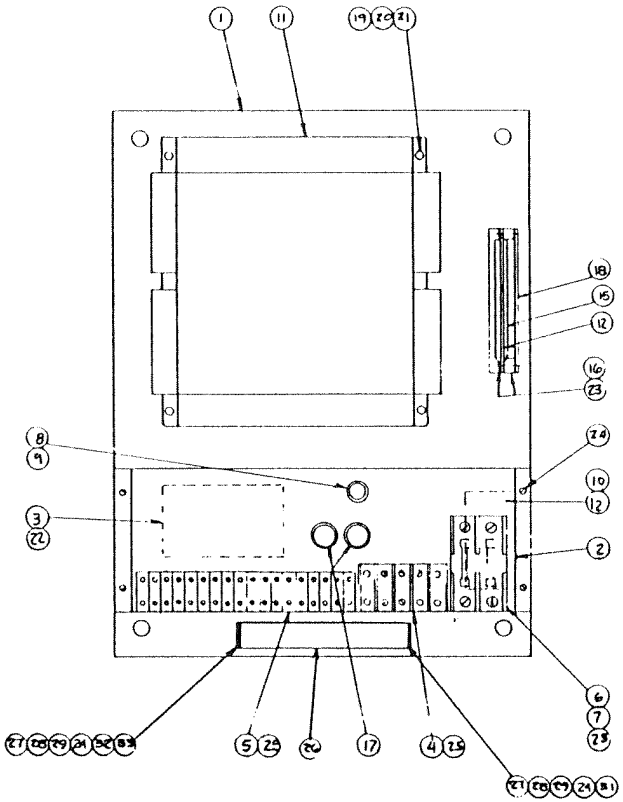
SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.

TITLE ASSY MODEL 6504 6604 6704

SIZE C DRAWING NO. C31376

SCALE — SHEET —

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	COMBINE HP RANGES FOR 6503, 6603 & 6703. UPDATE PART NOS.	5-1-77	
	B	ECO 428	9-9-77	
	C	CORRECT ITEM # 2	2-16-78	



MODEL	HP RANGE	ASSY DASH NO
6503	1/4 - 1	01
6603	1/2 - 2	02
6703	3 - 5	03

03	02	01	ITEM	PART NUMBER	DESCRIPTION
1	1	1	33	HNB3004-00	WASHER, LOCKING, STAR, EXT, 1/4
1	1	1	32	HNB2007-00	NUT, HEX, 1/4-20, UNC-2B
1	1	1	31	HNB1006-00	BOLT, HEX, 1/4-20, UNC-2A x 9 1/4
2	2	2	29	HNB3001-01	WASHER, MICA
2	2	2	28	HNB3002-01	WASHER, CENTERING, METAL
2	2	2	27	FBFA3223-A	MOUNTING BRACKET, RES.
1	1	1	26	PRE2005-00	BRAKE RESISTOR, 9Ω, 300W
10	10	10	25	———	SCREW, BD HD, 8-32, UNC-2A x 5/8
12	12	12	24	———	SCREW, BD HD, 8-32, UNC-2A x 1/4
4	4	4	23	———	SCREW, BD HD, 6-32, UNC-2A x 3/4
6	6	6	22	———	SCREW, BD HD, 8-32, UNC-2A x 3/8
4	4	4	21	———	WASHER, LOCKING, STAR, EXT, NO 8
4	4	4	20	———	NUT, HEX, 8-32 UNC-2B
4	4	4	19	———	SCREW, BD HD, 8-32 UNC-2A x 3/4
1	1	1	18	FBRB31373A	SUPPORT BRACKET
2	2	2	17	HFA2001-04	BUSHING, HEYCO
1	1	1	16	HFA4014-00	CIRCUIT BD SUPPORT
1	1	1	15	HPA1001-06	22 PIN CARD EDGE CONNECTOR
1			14	HLA1040-03	STICKER, MODEL NO 6703
	1		14	HLA1040-02	STICKER, MODEL NO. 6603
		1	14	HLA1040-01	STICKER, MODEL NO. 6503
1	1	1	13	HLA1017-00	TAG, SERIAL NO
1	1	1	12	C31355	ZERO SPEED SENSING CARD
1			11	D31372-3	6700 MODULE
	1		11	D31372-2	6600 MODULE
		1	11	D31372-1	6500 MODULE
1	1	1	10	PTR1001-00	TRANSFORMER
1	1	1	9	PFU1004-03	FUSE, 1 AMP, AGC
1	1	1	8	PFU2008-00	FUSE HOLDER
2			7	PFU1005-07	FUSE, 50 AMP, SC
	2		7	PFU1005-06	FUSE, 30 AMP, SC
		2	7	PFU1005-05	FUSE, 20AMP, SC
1			6	PFU2027-00	FUSE HOLDER BUSS 2920
	1	1	6	PFU2026-00	FUSE HOLDER BUSS 2919
1	1	1	5	HWA2031-01	TERMINAL STRIP 16 POS
1	1	1	4	HWA2032-00	TERMINAL STRIP 3 POS
1	1	1	3	ARE4008-00	CONTACTOR
1	1	1	2	FBRA32594A	BRACKET, SCREENED
1	1	1	1	FCHC29672B	CHASSIS

NEXT ASSY	USED ON
	6703
	6603
	6503

APPLICATION

MAT'L

FINISH

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

DRAWN BY RGC DATE 7-30-75

CHECKED BY

APPROVED BY

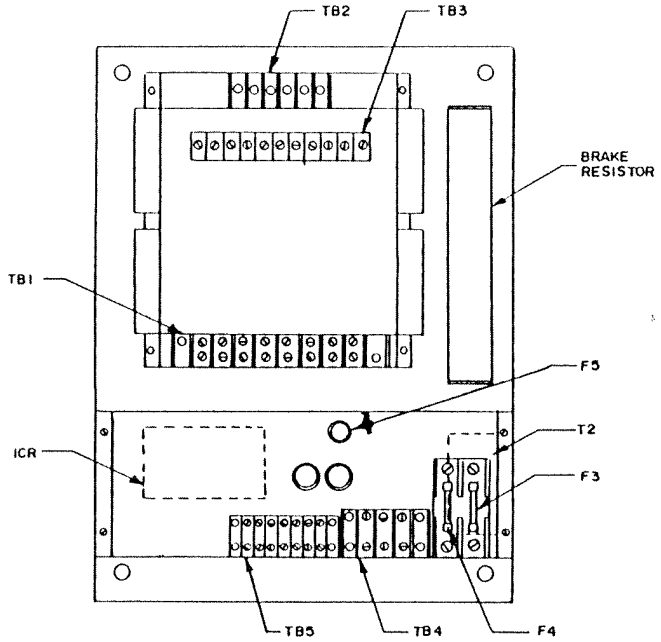
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE ASSY. MODEL 6503
6603
6703

SIZE C DRAWING NO C31375

SCALE —— SHEET ——

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



NEXT ASSY	USED ON
APPLICATION	

MAT'L

FINISH

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

DRAWN BY	DATE
SW5	9-9-75
CHECKED BY	
APPROVED BY	

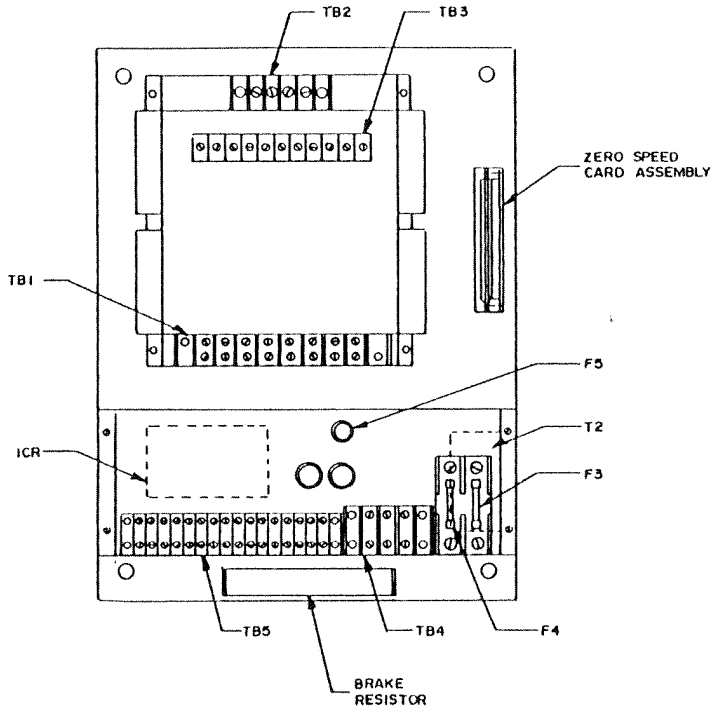
SECO ELECTRONICS CORP.
HOPKINS, MINNESOTA U.S.A.

TITLE
COMPONENT ID; MODEL 6504, 6604, 6704

SIZE	DRAWING NO.
C	C31434

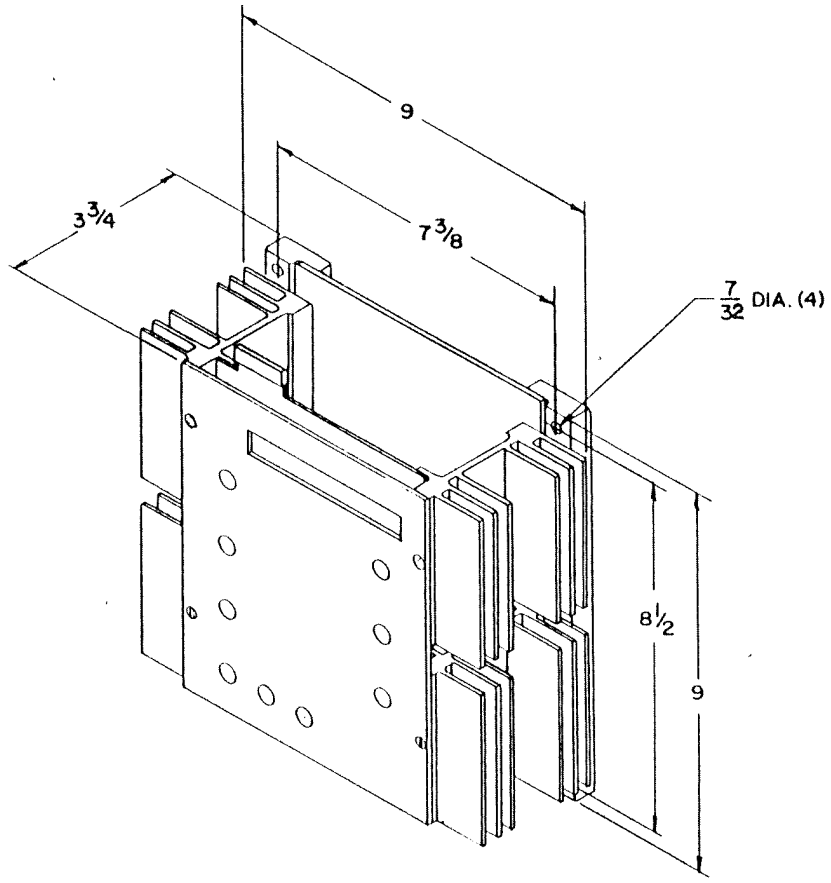
SCALE | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

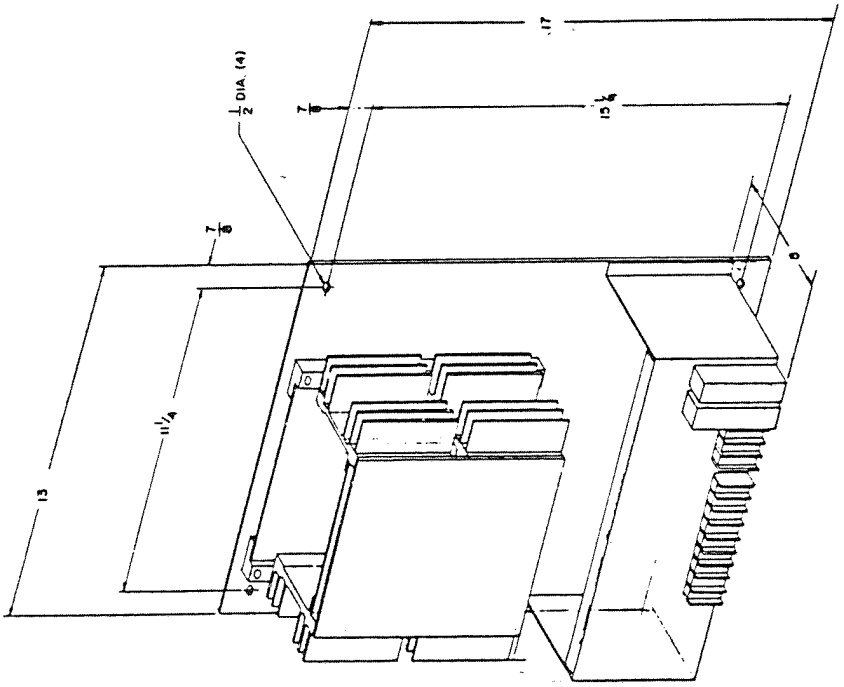


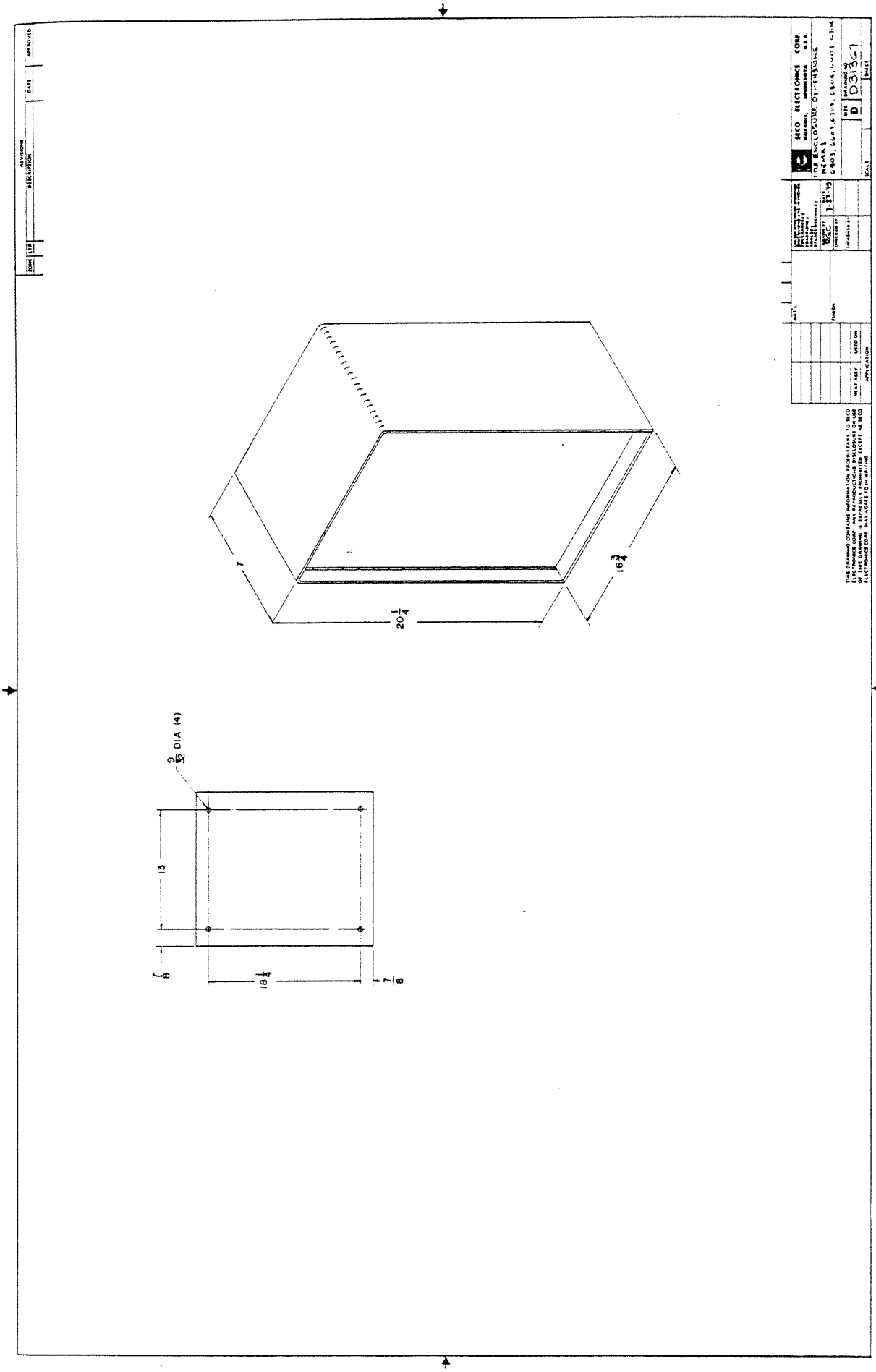
		MAT'L	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS: ANGLES: 3 PLACE DECIMALS:	SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.	
		FINISH	DRAWN BY SWS DATE 9-9-75	TITLE COMPONENT ID; MODEL 6503, 6603, 6703	
			CHECKED BY		
NEXT ASSY	USED ON		APPROVED BY	SIZE C	DRAWING NO. C31433
APPLICATION				SCALE	SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



		MAT'L	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± ANGLES ± 3 PLACE DECIMALS ±	SECO ELECTRONICS CORP. HOPKINS, MINNESOTA U.S.A.	
			DRAWN BY RGC DATE 7-21-75	TITLE MOUNTING DIMENSIONS MODEL 6300, 6500, 6700	
		FINISH	CHECKED BY		
			APPROVED BY	SIZE C	DRAWING NO C31365
NEXT ASSY	USED ON			SCALE NONE	SHEET 1 of 1
APPLICATION					


17
15 1/4
1/2 DIA. (4)
7/8
11 1/4
13
6


7
20 1/4
16 3/4
9/32 DIA (4)
13
7/8
18 1/4
7/8