MANUAL NO. 7141

THREE PHASE AC MOTOR CURRENT REGULATOR

DRIVE PART NO. 714-510-150-S001

MAY, 1991

DRIVE CENTRE
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Limited Warranty

For a period of two (2) years from date of original purchase, BALDOR will repair or replace without charge controls which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data encountered. No liability is assumed for expendable items such as fuses.

Good may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

The purpose of this manual is to provide installation, start-up, operating and maintenance instructions for a Model 714-XX-150 BALDOR Three Phase AC Current Regulator. This is a general purpose regulator capable of controlling currents of any type of three phase motor. Each regulator is factory tested and calibrated for a specific motor inductance.

Manual Sections 1 through 4 contain a general explanation for a BALDOR Three Phase AC Current regulator. The Title page, Fuse List, (Section 5) and Drawing List (Section 6 with attached drawings) contain information specific to this drive system.

1.2 SAFETY NOTICE

WARNING

This equipment contains voltages which may be as high as 800 volts and rotating parts on motors and driven machines. High voltage and moving parts can cause serious or fatal injury. Only qualified personnel familiar with this manual and any driven machinery should attempt to start-up or troubleshoot this equipment. Observe these precautions:

1. **USE EXTREME CAUTION, DO NOT TOUCH any circuit board, power device or motor electrical connection without insuring unit is properly grounded and no high voltage is present. DO NOT apply AC power before grounding per instructions herein. DO NOT open cover for 2 minutes after removing AC power to allow capacitors to discharge.**

2. **BE CERTAIN that possible violent motion of motor shaft and driven machinery due to improper control operation will not cause injury to personnel or damage to equipment. Peak torques of several times rated motor torque can occur during a control failure.**

3. **Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating.**

1.3 DRIVE DESCRIPTION (See Figure 1, Drawings 7482 & 7148)

The 714 series drives are especially adapted for high performance industrial servo control systems. It provides independent control of the current in each winding of a three phase AC motor from three phase 460 VAC power. Operation on a single phase power source with reduced performance, is also possible. Outline and mounting dimensions of the drive enclosure is specified on drawing 7153.

The drive consists of the following major elements in a compact enclosed assembly:

1. Mounting base with grounded heat sink, on which are mounted: bus capacitors C1 thru C6, the main power transistors Q1, Q2, and Q3, output current sensing resistors R2 and R3, three phase diode bridge BR1, input filter inductor L1, soft start resistor R1, soft start bypass SCR, (part of Q5 module) regenerated energy regulator transistor Q4 and the power terminal block. Units rated over 20 amps rms also have a fan for circulation of cooling air.

2. Base drivers A5, A6 and A7 mounted over the 3 main power transistors.

3. Swing-out circuit mounting plate with mod-demod assembly A4 and power supply assembly A3 mounted on the inside surface.

4. Control board A1 mounted on the outside surface of the swing-out plate.

The functional block diagram of Figure 1 and drawing 7148 shows the internal connection of the elements listed above.

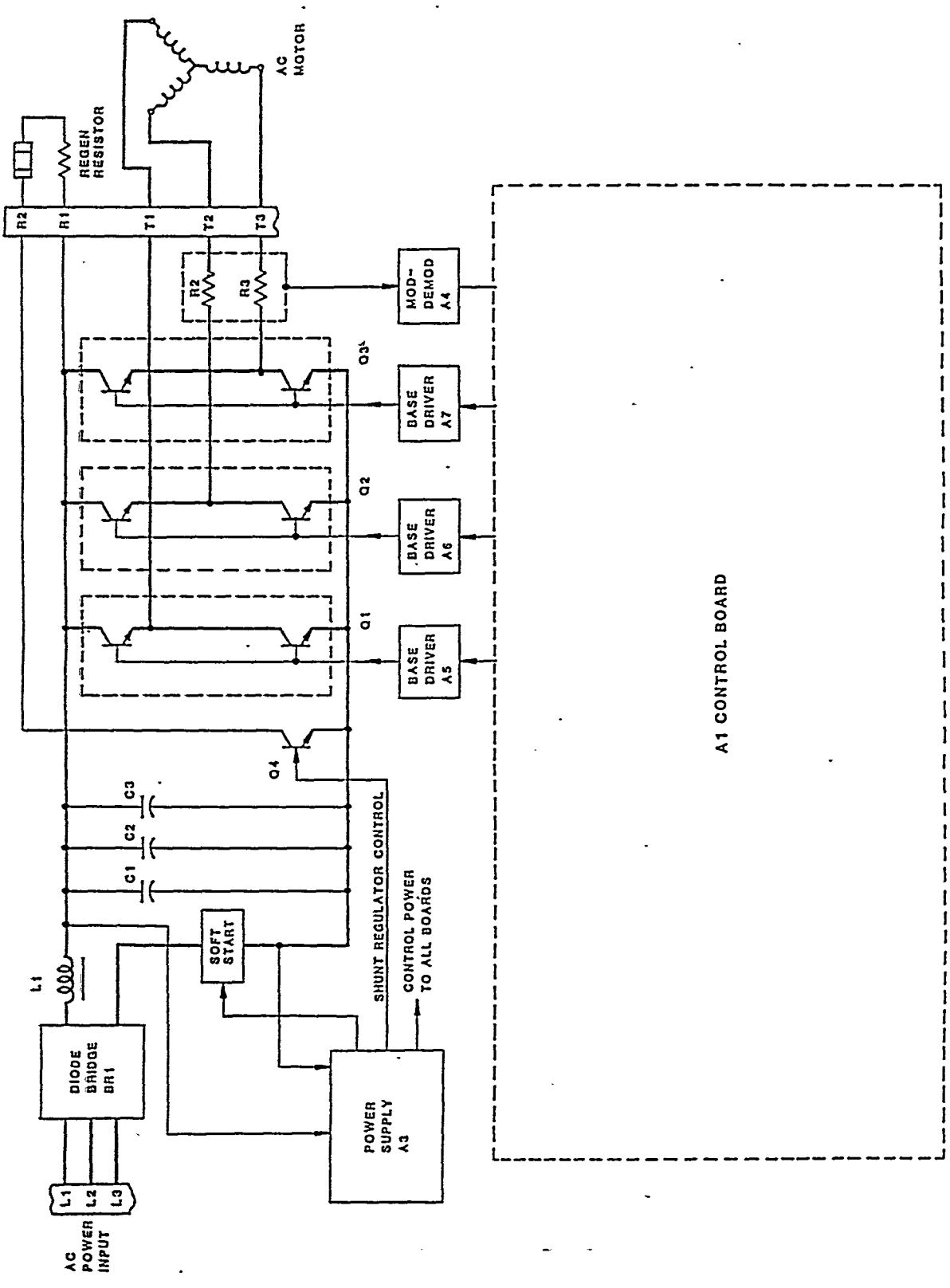
1.4 INTERCONNECTIONS

Drawing 7482 illustrates connections from the drive to: AC power, customer I/O signals and an AC motor. All power connections are made to the terminal block at the end of the drive. All signal connections are made to plug-in terminal strips J1 on control board A1.

1.5 INDICATORS, ADJUSTMENTS AND TEST POINTS

Drive status and fault LED indicators are located on control board, A1. No adjustments to the control board are required.

Simplified Block Diagram
FIGURE 1



1.6 Drive CIRCUIT FUNCTIONAL DESCRIPTION (See Figure 1)

The functional arrangement of the drive and AC motor is given in Figure 1. The voltage and frequency for the motor is generated by the three main power transistor pairs Q1, Q2 and Q3. The transistors convert DC voltage to three phase AC voltage by means of pulse width modulation (PWM). The DC bus voltage is provided by the three phase diode bridge BR1, inductor L1 and bus capacitors C1 thru C6. Input three phase AC power is supplied to bridge BR1 through drive terminals L1, L2 and L3. Power Supply Board, A3 is powered directly from the DC bus.

Power Supply Assembly, A3 furnishes several functions:

1) Controls the soft start circuit which limits charging current to the bus capacitors. This prevents excessive inrush currents upon application of AC power.

2) Controls the shunt regulator transistor Q4 to prevent an overvoltage condition on the bus supply by dissipating regenerated energy through an external resistor.

3) Develops regulated control power to operate the other circuit boards in the system.

4) Enables drive operation if power conditions are proper.

5) Connects a safety bleed resistor across the capacitor bank when AC line power is removed.

Each main power transistor pair is controlled and monitored by its associated Base Driver Assembly A5, A6 or A7. These base drivers amplify the PWM control signals and monitor the operation of the power transistors for fault conditions. In the event of an overload condition, the transistors are shut off, there by inherently protecting the drive against short circuits between outputs and between outputs and ground.

Motor currents through terminals T2 and T3 are sensed with shunt resistors and Mod-Demod assembly A4. The Mod-Demod isolates the power circuit from the control circuits and provides gain and offset trimming of the current feedback signals.

Three current control loops individually regulate current in the motor phases. Transistor base signals are produced by modulating the outputs of the current

error amplifiers with the triangle wave generated by the PWM oscillator. The fault disable logic suppresses transistor base signals when a fault occurs.

1.7 PROTECTIVE FEATURES

This drive includes extensive fault monitoring circuits to insure safe reliable operation and aid in troubleshooting. The following latching red LED fault indicators are supplied:

01	Fault on output T1 latches and lights this indicator. Fault may be excessive output current, loss of adequate transistor base drive, output short or ground fault.
02	Fault on output T2 latches and lights this indicator. Fault may be loss of adequate transistor base drive, output short or ground fault.
03	Fault on output T3 latches and lights this indicator. Fault may be loss of adequate transistor base drive, output short or ground fault.
±15	Latches and lights upon low or missing +15V or -15V control power.
OL	Latches and lights to prevent stressing of the amplifier according to an inverse time function.
OT	Latches and lights two seconds after motor or drive thermostat opens.
OV	A DC bus overvoltage lights up and latches this indicator. The most common causes of bus overvoltages are excessive input volts and regenerative energy exceeding the absorption capacity of the regenerative circuitry.
UV	A DC bus undervoltage lights upand latches this indicator. The most common causes of bus undervoltages are insufficient input volts and loss of one input phase.

All faults indicated by these indicators may be reset either by removing and reapplying AC power (power-up reset), orby applying a reset input to J1-9.

The following open collector outputs provide fault status information at J1:

FAULT (J1-15) Open collector output which switches high when the drive has shut down due to a fault.

All faults indicated by these indicators may be reset either by removing and reapplying AC power (power-up reset) or by applying a reset input to J1-9.

The following open collector outputs provide fault status information at connector J1:

READY (NO FAULT) (J1-14) Open collector which indicates either drive ready or drive fault.

1.8 STATUS INDICATORS AND OUTPUTS

The following green LED indicators show drive status:

ENABLE Lights when ENABLE 1 (J1-13) input is present.

READY (NO FAULT) Lights when power is applied, no fault conditions exist and reset is not applied. Normally lights 2 seconds after AC power is applied or reset is removed.

1.9 ADJUSTMENTS

1.9.1 CONTROL BOARD

No adjustments are provided on the control board.

1.9.2 MOD-DEMOD A4

These adjustments are factory preset and normally require no field adjustment.

R14 T3-OFFSET Adjusts offset of T3 current signal.

R15 T3-SCALE Adjusts scale factor of T3 current signal.

R30 T2-OFFSET Adjusts offset of T2 current signal.

R29 T2-SCALE Adjusts scale factor of T2 current signal.

2.0 INSTALLATION AND START-UP

Check motor nameplate and power source voltage to insure they match the drive nameplate and information contained in this manual. DO NOT USE THIS Drive ON ANY OTHER VOLTAGES OR MOTORS without factory approval.

2.1 MOUNTING (See Drawing 7153)

This drive is designed for panel mounting. Mount in a clean dry enclosure with an internal ambient temperature of not greater than +50 degrees C. DO NOT mount drive above transformer or other heat source. DO provide 2" minimum clear area above and below the drive to allow free flow of air over heat sink on the back of the enclosure.

Mounting dimensions are shown in drawing 7153. Note that both power and signal connections are made at the end of the drive. Provide access to the front of the module to adjust potentiometers and to observe indicators. Allow room for swinging the hinged circuit board panel out to gain access to the power components.

2.2 WIRING (See Drawing 7482)

All wiring shall be in accordance with the National Electric Code and applicable local codes. External or remote motor overload protection must be provided in accordance with the National Electrical Code, or equivalent. Install wiring as shown in Interconnect Diagram included in the Drawings section (Section 6) of this manual.

2.2.1 POWER WIRING

This drive requires input power protection in the form of either a circuit breaker or fuses. Recommended sizes and types of circuit breakers and fuses for this particular drive are given in section 5.0

Connect drive terminals L1, L2 and L3 to the load side of the customer supplied protective device. The drive may be powered with nominal 460 VAC line-line three phase power or single phase power. Phase sequence of incoming power is not important. If single phase power is to be used, connect power to drive terminals L1 and L2. Note that drive capacity is restricted to 60% of normal when operated on single phase power.

Wire the three phase motor stator to controller terminals T1, T2 and T3 using appropriately sized wire. Connect the controller to the motor either directly or indirectly through a DC rated contactor. A motor circuit contactor is recommended whenever a positive disconnection is required to prevent motor motion which could pose a safety hazard to personnel or equipment.

Ground **both** the chassis ground lug and motor frame to machine or plant ground with the same sized wire used for the AC connections.

High inertia and overhauling loads require an external regeneration resistor with suitable fuse or breaker protection. Minimum resistor resistance is limited by the regeneration capacity of the controller. Dissipation rating of the resistor must be selected to suit the average regeneration of overhauling load. The protective fuse or breaker must be rated at 800VDC minimum with sufficient capacity to interrupt, in the event of a control failure, a continuous connection of the resistor across the DC bus 560 to 700 VDC). BALDOR Controls supplies a number of kits for this purpose, see Section 5 for recommendations. Connect regeneration resistor and associated fuse or breaker between controller terminals R1 and R2.

2.2.2 SIGNAL WIRING

Motor thermal switch (if used) and current command input wires are terminated on plug-in terminal strip J1. Use twisted shielded pairs and triplets as shown in Drawing 7482 with shields terminated on controller end only. Common on this terminal strip is isolated from the power circuits and grounded to the chassis. All signal and control inputs are relative to chassis common.

The J1-9 Reset input may be operated with an open collector or switch input to common to reset any fault indication except power supply loss. This input must be open to operate the drive.

3.0 THEORY OF OPERATION

3.1 MOTOR ASSEMBLY

A typical AC induction motor has a 3 phase Y connected stator as illustrated in Figure 1. Rotor position and speed are sensed by a position transducer mounted on the motor. Control of the motor is effected by a motor controller supplied by the user or other third party.

3.2 CONTROLLER BUS POWER SUPPLY (Figure 1 and Drawing 7148)

Drawing 7148 shows the interconnection of the power components. Incoming AC power, at terminals L1 thru L3, is full-wave rectified by the diode bridge BR1 and filtered by inductor L1 and bus capacitors C1-C6. The inductor reduces current ripple on the bus capacitors, maximizes AC line power factor and minimizes EMI interference which might otherwise be conducted from the controller to the AC lines. The capacitors store DC bus energy providing a safe nominal voltage for the power transistors by supplying peak currents and absorbing a limited amount of regenerated power. Normal bus power supply voltages range from 550 VDC under heavy load at low line voltage to 695 VDC with no load at high line voltage. Motor regeneration will increase the DC bus voltage causing operation of the shunt regulator which limits the DC bus voltage below 755 VDC.

Excessive current inrush upon power application is prevented by the soft start circuit composed of R1, A8 fuses F1-F2 and the SCR in Q5. Operation of the soft start function is supervised by power supply A3. The SCR is fired to bypass charging resistor R1 only after the voltage drop on R1 is less than 30 VDC and the DC bus is over 450 VDC. Power supply A3 is interlocked with the control board A1 to prevent operation of the main output transistors until the capacitors are charged and the soft start SCR is turned on.

The DC bus voltage is continuously monitored by power supply A3 which controls the shunt regulator transistor Q4. When the bus voltage approaches 750 VDC, Q4 is turned on to draw current through the external regeneration resistor thus dissipating the regenerated energy. The peak energy that can be absorbed is limited by the maximum resistor current that can be controlled by Q4. The controller will limit bus capacitor voltage to 750 volts; for example a 20 ohm regeneration resistor connected to the controller will absorb 28 KW peak.

3.3 CONTROLLER POWER SUPPLY A3 (Drawing 7148)

The power supply assembly operates directly from the raw DC bus of 400 to 750 VDC derived from the full wave rectified 460 VAC line and accomplishes the following:

1) Supplies a 27 kHz, 100 VAC p-p regulated squarewave, nominally rated 100 watts for base drive and auxiliary loads.

2) Supplies a precision regulated plus and minus 15.0 VDC supply at 400 mA each.

3) Supplies a regulated plus 24 VDC for auxiliary relay and DC fan use, nominally rated at 25 watts total.

4) Delays power supply operation upon power application to ensure the external DC bus capacitors have charged sufficiently to start the power supply.

5) Limits the internally regulated intermediate 180 VDC bus voltage and current levels on a pulse-by-pulse basis. Overvoltage shutdown backs up the voltage limit in the event of a regulator transistor short thus preventing excessive output voltages.

6) Provides the gate signal to an external soft start bypass SCR which is coordinated with AC line voltage presence, bus to line differential voltage, and bus undervoltage.

7) Generates the base drive current to an external power transistor to shunt regulate the DC bus voltage during motor controller regeneration.

8) Provide independent opto-isolated status signals for bus undervoltage, bus overvoltage and shunt regulator transistor drive.

9) Turns on the safety bleed transistor during absence of all AC line power to connect the DC bus capacitors to an external discharge resistor.

The power supply assembly monitors the soft start resistor voltage and DC bus voltage for the following conditions:

1) Soft Start Resistor Voltage over 30 VDC, which inhibits turn on of the soft start circuit and the power output circuit.

2) DC Bus Voltage under 450 VDC, which inhibits turn-on of the soft start circuit and the power output circuit.

3) DC Bus Voltage over 750 VDC, which turns on the shunt regulator transistor Q4.

4) DC Bus Voltage over 770 VDC, which inhibits operation of the power output circuit.

Conductor spacings on the power supply are sufficient to provide a voltage isolation exceeding 1000 volts between the power circuit and control circuit common which is connected to chassis ground.

3.4 Drive POWER OUTPUT CIRCUIT

The power output circuit consists of six Darlington power transistors connected in a three phase bridge configuration. Clamping diodes are included on each transistor to provide a path for load current to return to the DC bus. Two transistors and their associated clamp diodes are contained in an isolated mounting type power module. Output currents are sensed with the two current shunts, resistors R2 and R3. The current sensors are 0.01 ohm on this controller.

The output transistors are driven and monitored by the base drivers (A5, A6 and A7). Control board A1 generates pulse width modulation (PWM) base signals for control of the transistors. One transistor in each pair must always be off at any given time to avoid shorting out the bus supply and damaging the output transistors.

3.5 Drive MOD-DEMOD A4

The mod-demod assembly consists of two independent and identical modulator-demodulator circuits for isolating the current feedback signals from the power circuitry. A carrier frequency of approximately 500 KHz modulates the voltage developed across a current sensing resistor. The resulting AC signal is transformer coupled to a demodulator which recovers the original signal. The offset of the amplified and isolated output is trimmed with R14 for the T3 channel and R30 for the T2 channel. Gain adjustment is provided to compensate for component tolerances, (including the sensing resistor) using R15 for the T3 channel and R29 for the T2 channel. These adjustments are factory made with the gain set for the current scale factor specified in the setup sheet of section 6. The mod-demod is operated from $\pm$15 VDC supplied by the power supply A3.

Conductor spacings on the mod-demod assembly are sufficient to provide a voltage isolation exceeding 1000 volts between the current sensing resistors and control circuit common which is connected to chassis ground.

3.6 Drive BASE DRIVERS A5, A6 & A7.

A base driver assembly consists of two independent base driver circuits, one for

each transistor of a dual Darlington power transistor module. Each channel has a transformer isolated power supply, an opto-isolated base driver and collector-emitter voltage desaturation detector.

The isolated $\pm$ 8 VDC power supply is obtained from the 27 KHz 50 volt square-wave source provided by power supply A3. The supply furnishes the current required for turning on and off the power transistors. The opto-isolated base driver circuit includes base current limiting which forces the Darlington transistor to pull out of saturation when it's collector current exceeds the transistors capacity. The base driver circuit also provides a high current reverse base drive for fast turn off of the power transistor. The desaturation detector monitors the power transistor's collector-emitter voltage and shuts it off when an overload current causes this voltage to exceed a safe level. This shutdown creates an output fault signal which is opto- isolated and sent to the control board A1. Fault monitoring circuits on the control board shuts down the controller, latches the fault and turns on the corresponding indication.

3.7 CONTROL BOARD A1 (See Figures 1)

The Control board performs the following functions:

1) Provide pulse width modulated outputs to the base drivers in response to current loop error signals.

2) Provide three current loops operating from external current command inputs with current feedback from the A4 mod-demod.

3) Provide latching overtemperature, overcurrent, supply voltage, and output fault protection and indication.

All A1 control boards with the same part number are identical. All components which are selected to suit a particular motor are located on this board.

3.7.1 OUTPUTS TO BASE DRIVERS

The base signal outputs are PWM waveforms, one for each of the six power output transistors. These signals are developed by three independent current loops, one per output phase. The current command for each loop is supplied from an external controller. Current feedback for two phases is supplied from the A4 mod-demod, the third feedback signal is the algebraic sum of the other two phases. Each current loop sums its respective command and feedback signals to produce a current error signal. The current error is compared to a triangle wave to produce a pulse width modulated (PWM) waveform. Changes in the PWM pulse widths control the three main power transistor pairs to regulate motor currents.

3.7.2 CURRENT CONTROLLERS

The current loops are proportional gain types with gains set by resistor on platform 1E, 1F & 1G. These resistors are located on the control board and are selected to suit the motor inductance. The scaling of the input current command signals is 2.4 amperes/volt. Maximum current is limited by limiting the voltage of the current command input.

3.7.3 LATCHING FAULT PROTECTION AND INDICATION

Fault conditions are detected, latched and indicated by red LEDs on control board, A1. The following indicators and their associated detectors are provided:

1) OV,UV: Monitors fault outputs of power supply assembly, A3, for overvoltage or undervoltage fault indications. Either of these conditions shuts down the drive and turns on the OV or UV LED.

2) 01, 02, or 03: Each transistor base driver fault output is monitored. The drive shuts down whenever an excessive voltage drop occurs (indicating an output overload) or driver supply failure occurs. See section 3.6. The fault is latched and indicated on the appropriate LED indicating which output connection, transistor pair or base driver caused the fault.

3) OT: Overtemperature is indicated by the opening of either the drive heat sink thermostat TS1 (set at 80 degrees C), or the motor winding thermostat. Shut down, latch and indication occurs after 2 second time delay. During the delay period, the open collector Overtemperature Warning output at drive J1-16 terminal is activated.

4) OVERLOAD: Overcurrent conditions are detected by comparing drive current to a level set by an inverse time function. (factory preset) The value of A2R72 is factory preset.

5) $\pm$15: A power supply failure detector monitors the $\pm$15 volt power supplies. The drive is shut down whenever either 15 volt supply drops below 12 volts. A complete loss of +15 volt power will not cause an indication since the logic operates on +15 volts, this condition will turn off all red and green LED indicators.

3.7.4 ENABLE LOGIC

The control board includes an LED indicated opto-coupled enable input. This input is operated by application of a 12 to 24 VDC source to enable the drive for normal operation.

3.7.5 OPEN COLLECTOR LOGIC OUTPUTS

Open collector logic outputs rated 75 mA, 30 VDC maximum are supplied at J1-14 and 15 for external indication of READY logic condition.

4.0 TROUBLESHOOTING

WARNING

This equipment contains voltages which may be as high as 800 volts and rotating parts on motors and driven machines. High voltage and moving parts can cause serious or fatal injury. Only qualified personnel familiar with this manual and any driven machinery should attempt to start-up or trouble-shoot this equipment. Observe these precautions:

1. **USE EXTREME CAUTION, DO NOT TOUCH any circuit board, power device or motor electrical connection without insuring unit is properly grounded and no high voltage is present. DO NOT apply AC power before grounding per instructions herein. DO NOT open cover for 2 minutes after removing AC power to allow capacitors to discharge. ALWAYS check DC voltage between two bus bars on large capacitors when opening enclosure and bleed down to 10 volts maximum with resistor before servicing.**

2. **BE CERTAIN that possible violent motion of motor shaft and driven machinery due to improper control operation will not cause injury to personnel or damage to equipment. Peak torques of several times rated motor torque can occur during a control failure.**

3. **Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating.**

4.1 INSTRUMENTS

Most troubleshooting can be performed with only a digital voltmeter (DVM) with an input impedance exceeding 1 megohm. Setup of speed loop response and evaluation of output current waveforms require a 1 MHz minimum bandwidth two channel oscilloscope.

4.2 TROUBLESHOOTING GUIDE

4.2.1 NO READY (RDY) LIGHT AND NO RED FAULT INDICATIONS

1. Check AC power connections and line fuses or breaker. AC voltage must be in the range of 380 to 506 VAC at terminals L1-L2, L2-L3, L3-L1 to operate the drive. If incoming power breaker or fuses are blown, remove AC power and check resistance between L1, L2 and L3 terminals with ohmmeter. Low resistance may indicate either a failed diode bridge or SCR. Observe WARNING precautions and replace BR1 or Q5 (SCR module).

2. Check supply voltages at connector J1-1 (+15 VDC) and J1-3 (-15 VDC) relative to common, J1-2. Both must be within $\pm$ 1 volt of nominal for proper operation.

   If $\pm$15 VDC power supplies are failed, remove AC power, wait 2 minutes, open cover and swing out hinged plate with control and personality boards to expose fuses A8F1, A8F2 and A3F1. Check fuses with ohmmeter and replace if necessary.

   WARNING

   High voltage on electrolytic capacitors C1 thru C6 decays slowly. DO NOT TOUCH. CHECK DC VOLTAGE BETWEEN THE TWO BUS BARS ON THE LARGE CAPACITORS WITH VOLTMETER and bleed with resistor to 10 volts DC maximum for safe servicing. DO NOT REMOVE PLUG A3P2 FROM POWER SUPPLY ASSEMBLY, A3. This will disconnect the safety bleed resistor, R5 from the DC bus.

   Verify that fuses A8F1 and A8F2 are good, then re-apply input power while observing POWER SUPPLY ON light, located on power supply board, A3. If this LED does not turn on, check fuse A3F1. If A3F1 is blown, turn off power wait 2 minutes and replace it. If POWER SUPPLY ON light does not turn on or if A3F1 fails a second time, replace power supply board, A3.

3. Check Reset Input J1-9 to be sure that it is not grounded. A voltage below +10 volts, relative to common, will prevent Ready.

4. If AC power and resets are OK, switch power OFF for 10 seconds then ON to reset power supply protection circuitry. Ready should light within 3 seconds.

5. If Ready doesn't occur with above steps, replace power supply A3 after observing precautions of (2) above. DO NOT remove any connectors or boards without removing power and ensuring main bus supply voltage is less than 10 volts DC.

4.2.2 "OV" or "UV " (OVER OR UNDERVOLTAGE) FAULT INDICATION

This latching fault indication occurs when main bus supply voltage has been too high (OV) or too low (UV), even momentarily.

1. Apply Reset Input (momentary closure between J1-9 & -8) to reset latch. Ready will occur within 3 seconds after Reset Input is removed if a

momentary high or low bus caused the tripoff. Momentary low bus voltage is usually caused by one AC line opening; high bus voltage is usually caused by regeneration of the motor with inadequate or open regeneration resistor circuit.

2. If Reset does not clear fault, check that AC voltage is in the range of 380 to 508 VAC line-line. Then turn off line voltage for approximately 10 seconds and reapply.

4.2.3 Ø1, Ø2 OR Ø3 FAULT INDICATION

1. **Current limit may be set too high, see setup sheet. Try reducing current limit 20% below normal to determine if limit is slightly over maximum allowable with motor being used.**

2. **If only one indicator is on, a ground fault on that output line is likely. If two or three indicators are on, the fault is most likely line-line. Remove AC power, disconnect output lines from control and check wiring and motor resistance line-line and line to ground.**

3. **If no external faults exist, remove AC power, wait 2 minutes, open enclosure observing WARNING precautions, bleed capacitor DC voltage to 10 volts maximum with resistor and thenshunt the two capacitor bus bars. Remove shunt between bus bars, then measure resistance from each bus bar to output terminals T1, T2 and T3 using ohmmeter polarity to back bias power transistor diodes shown in Figure 1. Any resistance less than 500K ohms indicates fault in transistor or internal wiring. Replace power transistor and its associated base driver for any outputs showing less than 500K resistance (power transistor failure usually damages its base driver). Check base drivers visually for burned components and be sure all connections to base drivers are properly installed.**

4. **If no power circuit faults are found, replace base driver or interchange with another output base driver to determine if fault follows base driver. If so, base driver should be replaced.**

5. **If base driver replacement does not eliminate faults, replace control board.**

4.2.4 "OT" FAULT INDICATION

1. **Check continuity of normally closed motor thermal switch input, at J1-11 to J1-12.**

2. **Drive heat sink may overheat due to excessive load, failed fan or clogged cooling fins. If indication persists with cool heat sink check the continuity of normally closed switch TS1 and its wiring.**

4.2.5 "IOC" (INSTANTANEOUS OVERCURRENT) FAULT INDICATION

1. **Current limit may be set too high. Try reducing command current limit 20% below normal to determine if limit is slightly over maximum allowable with motor being used.**

2. **Current loop compensation may be mismatched with motor being used. Individual phase currents can be monitored with oscilloscope at J5-1 & -6 relative to J5-3. Contact factory for assistance in optimizing compensation.**

3. **Replace control board if compensation is correct and overcurrent faults persist.**

4.2.6 "$\pm$15" FAULT INDICATION

1. **This latched fault indication will occur upon momentary reduction of $\pm$15 volts below allowable levels, possibly due to external load on these supplies. Apply Reset Input (momentary closure between J1-9 & -8) to reset latch.**

2. **Check $\pm$15 volt outputs at J1-1 & J1-3 to common J1-2, either voltage 20% below normal will cause the indication. Check control board IC chips and resistors for possible overheating indicating fault overloading the power supply. Replace power supply A3, observing WARNING precautions, if either 15 volt supply is low and no apparent fault exists on control board.**

4.2.7 "ENABLE" INDICATOR OFF WITH ENABLE APPLIED

1. **Check voltage between terminals J1-14 to -8, it must be 12 volts DC minimum with positive polarity at J1-14 to operate Enable circuits.**

2. **Replace control board if proper voltage is present.**

4.2.8 NO TORQUE WITH READY (RDY) AND CW INDICATOR ON

1. **Current command signal for one or more phases may be missing. Sum of three current command signals must equal to zero.**
2. **Replace control board if current commands are correct.**

5.0 PROTECTIVE DEVICES

5.1 INPUT PROTECTION

This drives must be provided with a suitable input power protective device. Use the recommended fuses or circuit breaker per table below:

Circuit Breaker - Three phase, 480VAC, 60A, thermal magnetic. G.E. TED series are typical.

Fuses - 500VAC, 50A fast blow type.
Buss KTS and NOS 80 are typical.

500VAC, 60A slow-blow type
Buss FRS 60 and LPS 60 are typical

Wire the drive, protective devices and motor with wire size AWG #8 wire or larger.

5.2 INTERNAL FUSE LIST

QTY	RATING	SWEO PN	COMMERCIAL EQUIV.	REF. DES.
2	2A, 500VAC	4342000	Buss FNQ 2	A8F1, A8F2
1	1 1.5A, 600VAC	4331500	Buss KTK 1 1/2 Littlefuse KLK 1 1/2	A3F1

5.3 REGEN RESISTOR KIT

The minimum resistance of the regeneration resistor is 10 ohms for this drive. BALDOR=SWEODRIVE supplies three kits coordinated with this drive.

R3 300 watts continuous, one 12 ohm, 300 Watt resistor with Buss KLK 30 fuse and holder.

R6 600 watts continuous, two 25 ohm 300 watt resistors to be used in parallel, with Buss KLK 30 fuse and holder.

R9 900 watts continuous, three 40 ohm, 300 watt resistors to be used in parallel, with Buss KLK 30 fuse and holder.

6.0 DRAWINGS

Setup Sheet - Appendix

7482	Interconnect Diagram
7148	Wiring Diagram - AC Brushless Servo Drive
7153	Outline and Mounting - AC Brushless Drive
0700	Installation Drawing - Regen Resistor Kit
PL-714-510-150-S001	Parts List - Drive
PL0714046	Parts List - Power Base
PL0074057	Parts List - Control Board

APPENDIX

SETUP FOR DELTA TAU SMCC USING THREE PHASE CURRENT REGULATOR BOARD (SWEO P/N 0074507)

1. GAIN OF CURRENT LOOPS

Estimate the stator leakage inductance and compute the value of the feedback resistor in the current error amplifier from the following formula:

R1 = R2 * (150 * Fc * Lm * Kct / Vbus) - R3

Where:

R1 = Error amp platform feedback resistor
R2 = Error amp on board feedback resistor
R3 = Error amp input resistor
Fc = Desired crossover frequency in Hertz, type 1000 Hz
Lm = Stator leakage inductance, line to neutral
Kct = Power amplifier feedback gain in Amps / Volt

Amp Rating	Kct
-24, -34	6.67
-35, -45	10
-47, -57	13.3
-510	20
-710, -714	26.7

Vbus = DC Bus voltage of amplifier

AC Voltage	Vbus
230 VAC	325
460 VAC	650

2. SMCC Flux Vector Related Constants

The following "i" parameters of the Delta Tau SMCC board are constants required to configure it as a Flux Vector Controller. For explanation of the parameters see "DELTA TAU SMCC I PARAMETERS"

i07 = 65498
i13 = 1

i15 = 0
i27 = 15616
i41 = 0
i43 = 130
i44 = 1

3. Encoder "i" Parameters

Set encoder sensitive "i" based on the resolution of the encoder used, refer to "DELTA TAU SMCC I PARAMETERS" for instructions.

i06
i17
i28
i39
i40

4. Motor Parameter Estimates

To set the magnetization and slip gain of the induction motor it is necessary to first estimate the parameters then operate the motor with the estimates to arrive at the final values.

i42 = 36 * Iexc / Kamp

where:

Iexc = excitation current in amps (assume Iexc = 1/4 Irated to start)

Kamp = Amplifier current command gain in Amp / Volt

i45 = 200 (estimate)

5. Encoder Phasing (i39) Verification

Since induction motor terminal markings and shaft rotation is not standardized it is necessary to verify the phasing of the motor with respect to the encoder rotation. If the encoder phase is reversed the motor will run away. To verify encoder phasing perform the following steps:

A. Command "00" from the keyboard.
B. Check the rotor for stiffness. If rotor turns freely phasing is correct. If rotor is stiff change i39 from 3 to 7 (or 7 to 3)

6. Magnetization Current (i42) Adjustment

Use the jog command to set the motor speed at 1/2 of rated speed. Adjust i42 to obtain 1/2 of the rated motor voltage. The motor terminal voltage must be read using an average reading voltmeter. Due to the chopped nature of the motor voltage, some DVM's will not measure the voltage correctly without additional filtering of the voltage signal.

7. Slip Gain (i45) Adjustment
Two methods are possible; 1) locked rotor and 2) motor acceleration.

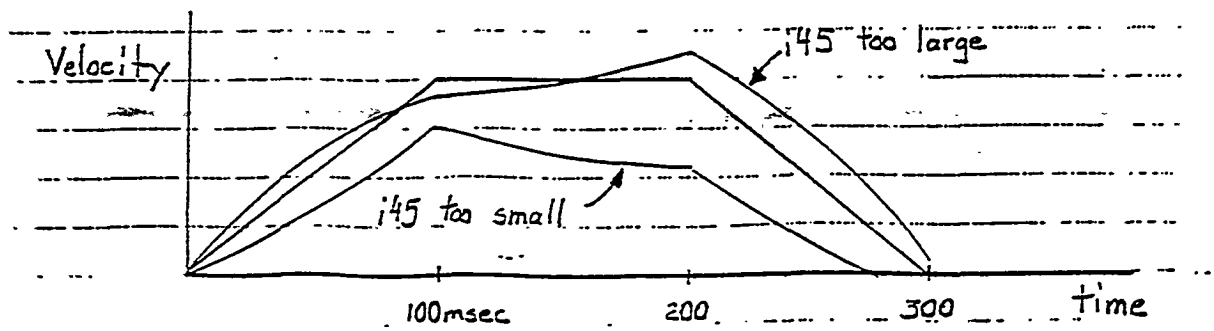
Locked Rotor Method

A. Lock rotor and observe motor current with a scope.
B. Set "O" command for rated current.
C. Adjust i45 to obtain a motor current frequency at the rated slip frequency.
NOTE: The "O" command must be re-entered every time i45 is changed.

Motor Acceleration Method

Using the data collection feature of the SMCC program, ALT][F2], setup a program to accelerated the motor with a command of "O20", for 100 msec followed by "00" for 100 msec, then decelerate to stop with "O-20" for 100 msec. The time may be increased until the velocity is near the range you will be working in. The number of cycles need only be 1 or 2. The resulting velocity profile can be observed to determine the proper setting of i45.

(Note: This procedure only works when the friction is small with respect to the rotor inertia).



JUMPER POSITIONS

8. These are the jumper positions critical for the amplifier. The rest may be left alone or changed on user's I/O requirements.

E1 No jumper installed for differential current command.

E9 No Jumper installed for differential current command.
E11 No jumper. Keeps the amplifier isolated.
E15 No jumper. Keeps the amplifier isolated.
E22 (Optional) Install jumper to allow i10 to drive "Following Error" output.
E24 No Jumper. Keeps the amplifier isolated.
E42 Jumper 1 to 2 for differential encoder. Jumper 2 to 3 for Non-differential encoder.

9. Finalization

Save the "i" parameters in non-volatile memory using the "s", save command. Save a copy of the "i" parameters to disk for future reference.

OBJECT #: 714-510-150S1 OBJ TYPE: MP REV: E STATUS: PRD/L

OBJ DESC: AC SERVO,460V,714,-/-/-,,NONE
REV DESC: REACTIVATE SPEC

PART #	SEQ	TY	RV	PART DESCRIPTION	QTY	UOM	USE
INVERTER	003	DR	F	INVERTER CONTROL PRODUCT (GENERIC	0.0000	EA	
NP0826	021	PT	D	NP- HARMONIZED INVERTER/VECTOR	1.0000	EA	
V#7141	025	PT	-	INSTRUCTION MANUAL	1.0000	EA	
V0074057	035	PT	-	CONT. BD, 3PH I-REG	1.0000	EA	
				A1			
V1008684	040	PT	F	LABEL, CAUTION; GM NAMEPL	1.0000	EA	
V1008933	045	PT	A	LABEL, UL LISTED,	1.0000	EA	
V1740903	050	PT	-	PERSONALITY PLATFORM	1.0000	EA	
V6020120	055	PT	A	CONN.5MM,HOR, 20 POS; URSPHOENIX 1	1.0000	EA	
				MFG: PHOENIX CONTACT 1754805			
				P1			
V1767702	060	PT	-	BOARD COVER SUB-ASSY REV G	1.0000	EA	
V6502406	065	PT	-	STANDOFF 6-32 X 3/8	3.0000	EA	
				MFG: AMATOM 8213-B-0632-28			
V6910205	070	PT	-	STUD, 1/4 TURN FLUSH	2.0000	EA	
				MFG: SOUTHCO 82-28-220-16			
V6910450	075	PT	-	RETAINER, SPLIT RING	2.0000	EA	
				MFG: SOUTHCO 82-32-101-20			
V1077371	080	PT	-	LABEL, SHIPPING BOX	1.0000	EA	
V1007621	085	PT	-	LABEL, PRODUCT IDENTIFICATION	1.0000	EA	
V0714046	090	PT	D	POWER BASE 714-510-S	1.0000	EA	

*** END OF REPORT ***

OBJECT #: V0714046 OBJ TYPE: PT REV: D STATUS: PRD/L

OBJ DESC: POWER BASE 714-510-S
REV DESC: DELETED (SEQ. 250) V1071334

PART #	SEQ	TY	RV	PART DESCRIPTION		QTY	UOM	USE
V6910620	005	PT	-	THERMAL PAD, SM DIODE/SCRPOW.D; AL		1.0000	EA	
				MFG: POWER DEVICES INC.	AL-364-081			
				;Q5				
V6910621	010	PT	A	THERMAL PAD, SM XSTR, 2 HOLE		1.0000	EA	
				MFG: POWER DEVICES INC.	AL-370-134			
				;Q4				
V6910643	015	PT	A	THERMAL PAD, LG XSTR, 4 HOLE		3.0000	EA	
				MFG: POWER DEVICES INC.	AL-425-244			
				;Q1-Q3				
V6910644	020	PT	-	THERMAL PAD - THERMAL SW		1.0000	EA	
				MFG: POWER DEVICES INC.	AL-120-082			
				;THERMAL SWITCH				
V6910646	025	PT	-	THERMAL PAD, 3 PH BRIDGE POW.D; AL		1.0000	EA	
				MFG: POWER DEVICES INC.	AL-256-189			
				;BR1				
V1070821	030	PT	-	HEAT SINK, 12", AC BRLS		1.0000	EA	
V1070732	035	PT	-	PANEL MTG CHASSIS - LONG		1.0000	EA	
V3615112	040	PT	-	TRANSISTOR-DUAL,DARL	FUJI 2DI	3.0000	EA	
				MFG: FORT SMITH	TX0086A04			
				MFG: FUJI	2DI150Z-120			
				Q1-Q3				
V3510010	045	PT	A	TRANSISTOR-SING.DARL		1.0000	EA	
				MFG: FORT SMITH	TX0076A01			
				MFG: POWEREX	KS221K1010			
				MFG: SEMIKRON	SK100DA100D			
				Q4				
V3710616	050	PT	A	DIODE BRIDGE, 3PH, 60A, 1600V; SE		1.0000	EA	
				MFG: SEMIKRON	SKD-60/16			
				BR1				
V3750612	055	PT	-	DIODE/SCR 55A 1200V		1.0000	EA	
				MFG: FORT SMITH	DI0067A00			
				MFG: SEMIKRON	SKKH-56/12D			
				Q5				
V18162200	060	PT	A	DUAL HALL EFFECT ASSY		1.0000	EA	
V1004181	065	PT	-	LABEL, TERMINAL BLOCK, USD		1.0000	EA	
				;TB1				
V6105208	070	PT	-	TERM BLOCK, 90A, 8POS	USD #1400	1.0000	EA	
				;TB1				
V6280014	075	PT	A	SCREW LUG 12-2 AWG	PENN-UNIO	1.0000	EA	
				MFG: ILSCO	TA-2			
				MFG: PENN-UNION	LA-2			
V1071307	080	PT	-	CABLE, AC CONTROLLER		1.0000	EA	
V1071353	085	PT	C	CABLE ASSY		1.0000	EA	
V7417825	090	PT	B	CAP, ALUM ELECT, 2900MFD, 400VDC		4.0000	EA	
				MFG: REDMOND				
				C1-C4 ; POS A,B,D,E				
				;POS A,D TO Q1				
				;POS B,E TO Q3				
V7999107	095	PT	-	BOOT, INS VERT 3.0" DIA. CAPLUGS S		4.0000	EA	

OBJECT #: V0714046 OBJ TYPE: PT REV: D STATUS: PRD/L

OBJ DESC: POWER BASE 714-510-S
REV DESC: DELETED (SEQ. 250) V1071334

PART #	SEQ	TY	RV	PART DESCRIPTION			QTY	UOM	USE
				MFG: CAPLUGS DIVISION		SC-3			
V7999000	100	PT	-	VERT,MTG,CLAMP 3" DIA	MALLORY V		4.0000	EA	
				MFG: MALLORY		VR12B			
V8344047	105	PT	-	RES, REB, 47, 10% 110W	P/N 18-72		1.0000	EA	
				MFG: MILWAUKEE RESISTOR		18-72-47R W/SQC			
				;R1					
V8364236	110	PT	-	RES,R-TM,3650,5% 65W			1.0000	EA	
				MFG: MILWAUKEE RESISTOR		01120723650.0E			
				;R5					
V8399003	115	PT	-	CENTER WASH, 3/4 CR	MILWAUKEE		2.0000	EA	
				MFG: MILWAUKEE RESISTOR		RESISTOR			
				MFG: OHMITE		6001			
V8399023	120	PT	-	MICA WASH, 3/4 CR	12-800-00		2.0000	EA	
				MFG: MILWAUKEE RESISTOR		RESISTOR			
				MFG: OHMITE		6013			
V8399005	125	PT	A	CENTER WASH, 1 1/8 CR			2.0000	EA	
				MFG: MILWAUKEE RESISTOR		RESISTOR			
				MFG: OHMITE		6003			
V8399025	130	PT	A	MICA WASH, 1 1/8 CR			2.0000	EA	
				MFG: MILWAUKEE RESISTOR		RESISTOR			
				MFG: OHMITE		6017			
V8399216	135	PT	-	BOLT 10-32 X 5			2.0000	EA	
				MFG: MILWAUKEE RESISTOR		RESISTOR			
V1000462	140	PT	A	SUPPORT BRKT 4-40			3.0000	EA	
				;POS B,C,E					
V6911431	145	PT	A	TIE ANCHOR 10 SCRW;BNSTCKPRIEB-PAN			1.0000	EA	
				MFG: PANDUIT		TA1S10			
V6911432	150	PT	A	TIE MT,SM ADHESIVE BK, 1" X 1"			3.0000	EA	
				MFG: PANDUIT		ABM2S-A			
				MFG: FORT SMITH		HW3214A00			
V1004041	155	PT	-	BRIDGE MINUS STRAP			1.0000	EA	
V1070811	160	PT	-	BUS BAR W SNUBR PROV	REV C		2.0000	EA	
V7001347	165	PT	A	CAP,POL, .047 ,1200			2.0000	EA	
				MFG: S.B. ELECTRONICS		715P473912MD3 OR 512MD3			
				MFG: MALLORY		PVC16147			
				;C7,C8					
V8392D10	170	PT	-	RES,AX,1.00,3W,NON I			2.0000	EA	
				MFG: DALE		NS-2B			
				;R6,R7					
V6291004	175	PT	-	TERMPOST,INS 6 X.581	VEN.#2509		2.0000	EA	
V6293206	180	PT	-	TERM,LCKWSHR 2HL #6			2.0000	EA	
V6293210	185	PT	-	TERM,LCKWSHR 2HL#10 UNCNTA/W;	ZEIR		2.0000	EA	
V2050013	190	PT	-	INDUCTOR,LNK 60A200U	PCI		1.0000	EA	
				;L1					
V3235626	195	PT	B	DIODE RECT 5A 600V			2.0000	EA	
				MFG: FORT SMITH		DI0061A00			
				MFG: GENERAL ELECTRIC		1N5626			
				;D1,D2					
V1071287	200	PT	A	CABLE, AC CONTROLLER			1.0000	EA	

OBJECT #: V0714046 OBJ TYPE: PT REV: D STATUS: PRD/L

OBJ DESC: POWER BASE 714-510-S
REV DESC: DELETED (SEQ. 250) V1071334

PART #	SEQ	TY	RV	PART DESCRIPTION	QTY	UOM	USE
V17880060	205	PT	B	CABLE, 8 GA BLK, 600V, 2.5 IN.	2.0000	EA	
V1071301	210	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V17880036	215	PT	B	CABLE, 8 GA BLK 600V, 18 IN.	2.0000	EA	
				;Q2 THRU NANA SENSOR			
				;CLOSEST TO TB1,			
				;CONNECT TO TB1-T2.			
				;Q3 THRU NANA SENSOR			
				;CLOSEST TO Q2,			
				;CONNECT TO TB1-T3.			
V1071305	220	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V1071286	225	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V1071308	230	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V17840014	235	PT	B	CABLE, 8 GA BLK 600V, 10.25 IN	1.0000	EA	
V1071312	240	PT	A	CABLE ASSY,230/460	1.0000	EA	
V1071322	245	PT	A	CABLE ASSY,230/460	1.0000	EA	
V1071342	255	PT	A	CABLE ASSY,460 VAC	2.0000	EA	
V1071360	260	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V1071361	265	PT	A	CABLE, AC CONTROLLER	1.0000	EA	
V0070872	270	PT	A	POWER SUPPLY ASSY	1.0000	EA	
				;A3			
V17860016	275	PT	C	CABLE, 22 GA RED UL1015,6.25IN	1.0000	EA	
V17860017	280	PT	C	CABLE, 22 GA WHT UL1015, 4.0IN	1.0000	EA	
V1864902	285	PT	-	COMPONENT ASSY, 22 OHM 2W	1.0000	EA	
				;R4			
V1074385	290	PT	A	CABLE, SINGLE AXIS C9 TO BUS	1.0000	EA	
V1070792	295	PT	-	BRKT, LV BASE DRIVER REV H	1.0000	EA	
V1070791	300	PT	-	BASE DR SUPPORT BRKT REV H	1.0000	EA	
V6911166	305	PT	-	SUPPORT,EDGE 5/8	6.0000	EA	
				MFG: RICHCO EHCBS-10-19			
V0070842	310	PT	B	SNUBBER ASSY 460V TURNKEY S	1.0000	EA	
				;A8			
V0725216	315	PT	A	BASE DRIVER, Z-TYPE	3.0000	EA	
				A5-A7			
V1077161	320	PT	-	SIDE PANEL - LONG VERSIONREV C	1.0000	EA	
V1077151	325	PT	-	UNIT COVER - SUB-ASSY, REV B	1.0000	EA	
V6911314	330	PT	-	SNAP BUSHING 15/16 ID	2.0000	EA	
				MFG: HEYCO MOLDED PRODUCT 2182			
				MFG: MICRO PLASTICS, INC 22MP11815			
V6910353	335	PT	-	RECEPTACLE, 1/4 TURN,	4.0000	EA	
				MFG: SOUTHCO 82-47-113-15			
V6910205	340	PT	-	STUD, 1/4 TURN FLUSH	2.0000	EA	
				MFG: SOUTHCO 82-28-220-16			
V6910450	345	PT	-	RETAINER, SPLIT RING	2.0000	EA	
				MFG: SOUTHCO 82-32-101-20			
V1076831	350	PT	-	END PANEL, SINGLE FAN REV C	1.0000	EA	
EF0025A00	355	PT	A	24VDC 110CFM COOLING FAN;IEC; EBM	1.0000	EA	
				MFG: REDMOND 6950010			

OBJECT #: V0714046 OBJ TYPE: PT REV: D STATUS: PRD/L

OBJ DESC: POWER BASE 714-510-S
REV DESC: DELETED (SEQ. 250) V1071334

PART #	SEQ	TY	RV	PART DESCRIPTION		QTY	UOM	USE
V6950400	360	PT	-	FINGER GUARD, 4 IN.	PSC# MG50	1.0000	EA	
V7912520	365	PT	-	CAP,DC,OVAL, 2,1000V		1.0000	EA	
				MFG: FORT SMITH	CC0058A01			
				MFG: RONKEN	86A81205K12			
				;C9				
V7999150	370	PT	A	CAPACITOR TERMINAL BOOT		1.0000	EA	
				MFG: FORT SMITH	CC0062A00			
				;C9				
V7999014	375	PT	-	BRACKET,LAY DOWN	RONKIN P/	1.0000	EA	
				MFG: RONKEN	25A011201			
				;C9				
V1079231	380	PT	A	CABLE, CONTROL BD TO NANA		1.0000	EA	
V1072084	385	PT	G	CABLE ASSY, 460V DRIVE		1.0000	EA	
V1082291	390	PT	-	IDENTIFICATION LABEL		1.0000	EA	
V1007622	395	PT	-	LABEL, RECOMMENDED TORQUES		1.0000	EA	
V1005751	400	PT	-	LABEL GRD		1.0000	EA	
V6911400	405	PT	A	CABLE TIE MIN .87DIA		10.0000	EA	
				MFG: AMP INCORPORATED	2-604771-9			
				MFG: PANDUIT	PLT1M			

*** END OF REPORT ***

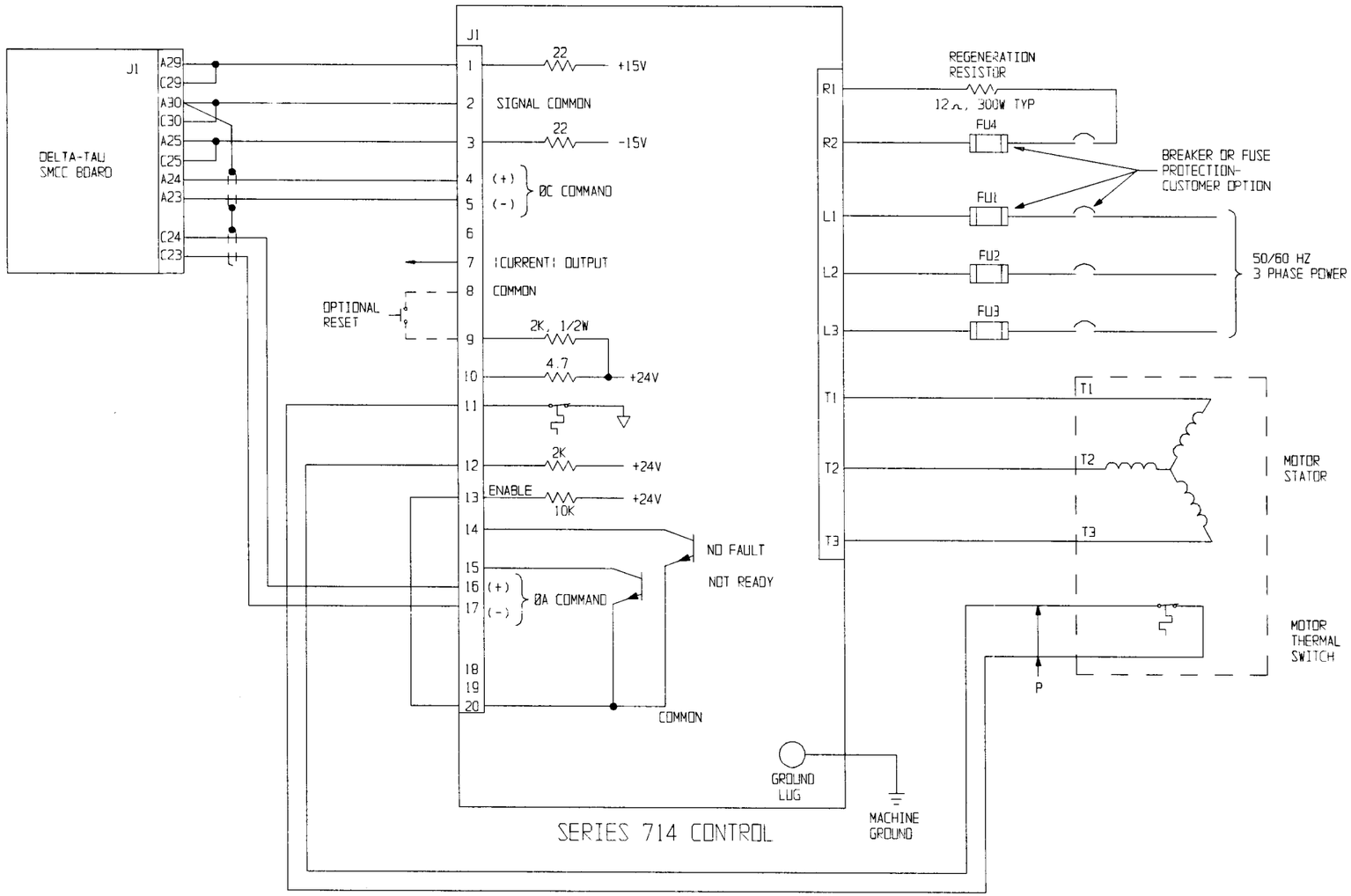
OBJECT #: V0074057 OBJ TYPE: PT REV: - STATUS: PRD/L

OBJ DESC: CONT. BD, 3PH I-REG
REV DESC: 1991-05-29 - IDL - PT:2

PART #	SEQ	TY	RV	PART DESCRIPTION		QTY	UOM	USE
V1074057	005	PT	A	CONT. BD, 3 PH I-REG,	TURNKEY A	1.0000	EA	

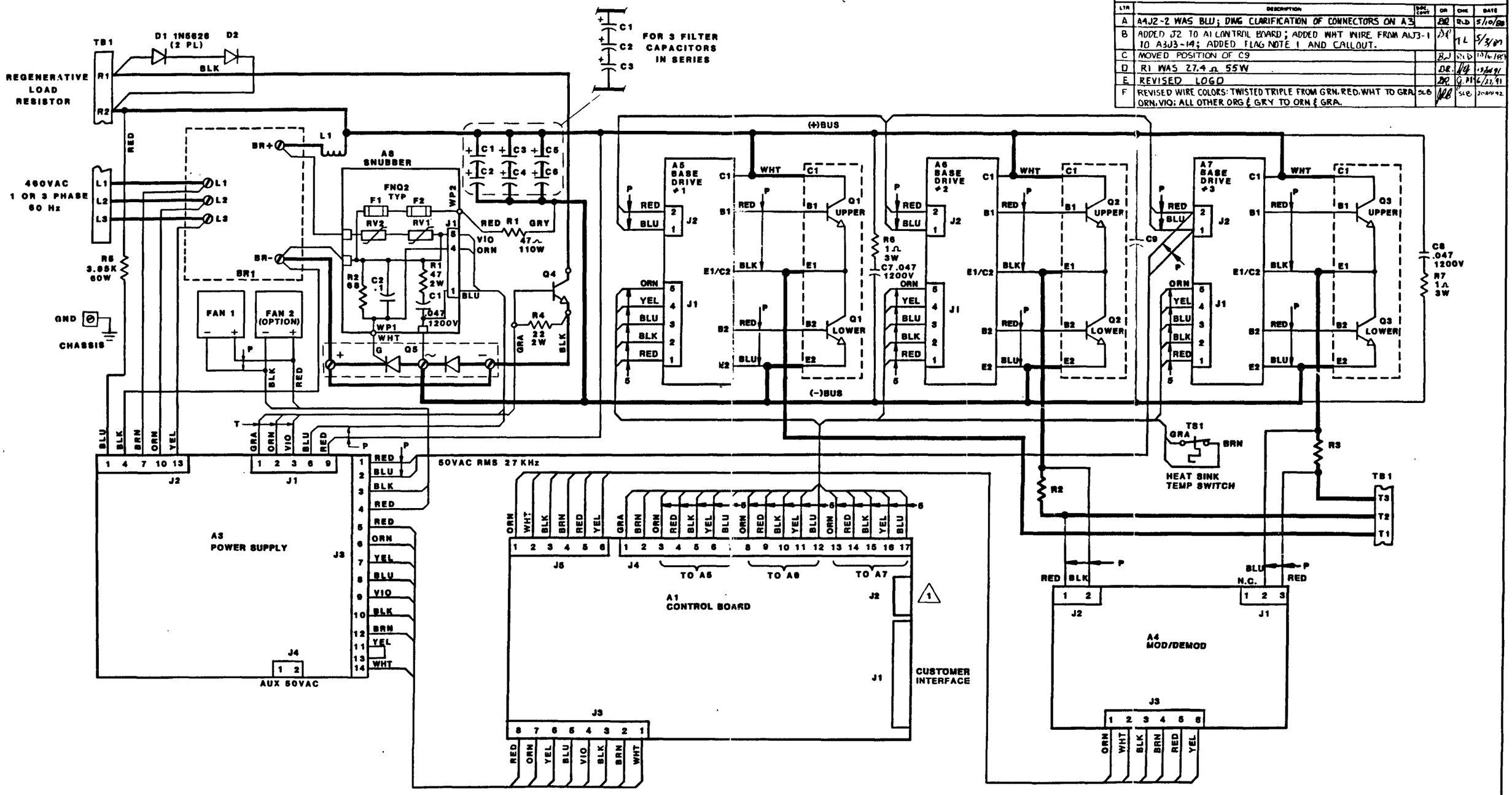
*** END OF REPORT ***

REVISIONS				
LTR	DESCRIPTION	DR	CHK	DATE



APPLICATION		CONTRACT NO.		SWED CONTROLS INC.
NEXT ASSEMBLY	DASH NO.	1967		BELLEVUE, WA 98005
		PREPARED D. ROUSSEAU	DATE 3/21/89	INTERCONNECT DIAGRAM INDUCTION MOTOR DRIVE
		CHECKED G. OLMSTEAD	DATE 3/22/89	
		APPD.	DATE	SIZE D FSCM NO. 45586 7482
		APPD.	DATE	SCALE NONE SHEET 1 OF 1

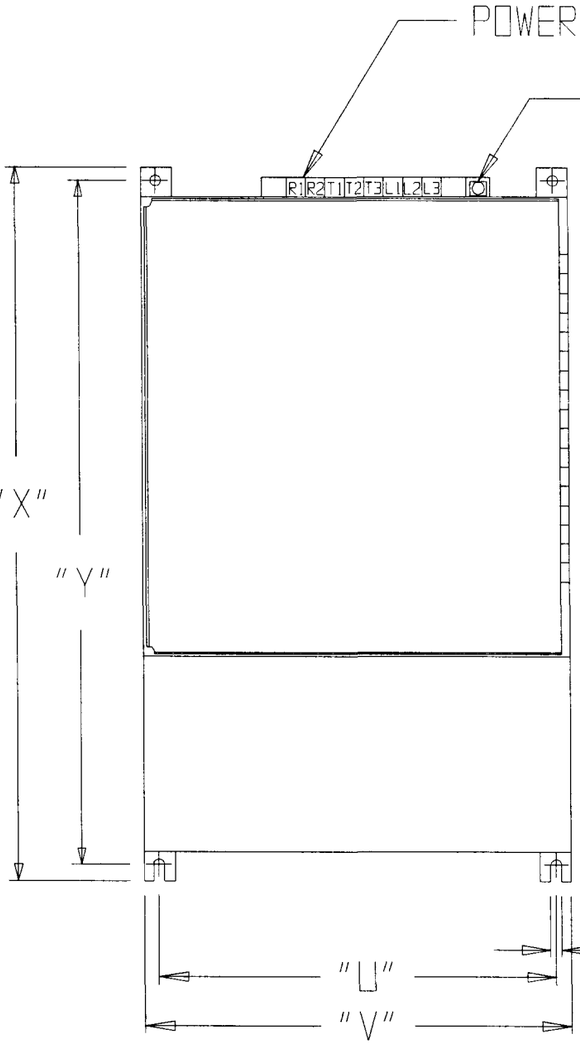
REVISIONS					
LTR	DESCRIPTION	DOC CONT	DR	CHK	DATE
A	A4J2-2 WAS BLU; DWG CLARIFICATION OF CONNECTORS ON A3		BJ	RLD	5/10/88
B	ADDED J2 TO A1 CONTROL BOARD; ADDED WHT WIRE FROM A1J3-1 TO A3J3-14; ADDED FLAG NOTE 1 AND CALLOUT.		DP	TL	5/3/89
C	MOVED POSITION OF C9		BJ	RLD	10/16/89
D	R1 WAS 27.4Ω 55W		DP	TL	12/20/90
E	REVISED LOGO		DP	RLD	6/21/91
F	REVISED WIRE COLORS: TWISTED TRIPLE FROM GRN, RED, WHT TO GRA, ORN, VIO; ALL OTHER ORG & GRY TO ORN & GRA.	SCO	MB	SLC	2/20/92

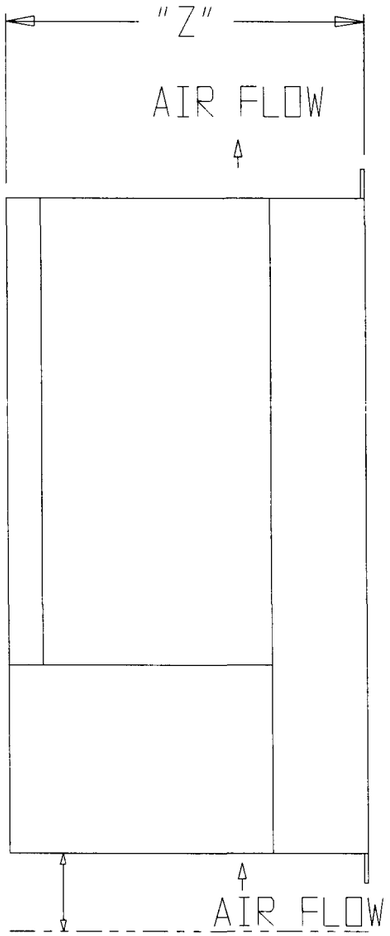


⚠1 J2 MOTOR FEEDBACK CONNECTOR ONLY EXISTS ON SERVO MODELS

APPLICATION	CONTRACT NO	BALDOR SWEODRIVE	
NEXT ASSEMBLY / DASH NO			
PREPARED B. J.	DATE 12-11-87	CONNECTION DIAGRAM 460V A.C. MOTOR CONTROLLER	
CHECKED	DATE		
APPD	DATE	SIZE D	CODE IDENT NO. 4S586
MFG CONT	DATE	7148	F
		SCALE	SHEET 1 OF 1

REVISIONS				
LTR	DESCRIPTION	DR	CHK	DATE
A	ADDED "C" SIZE CONTROLLER AND Z,U & V DIMS	DR	DET	1 APR 91
B	ADDED (CM) DIMS	JRB		





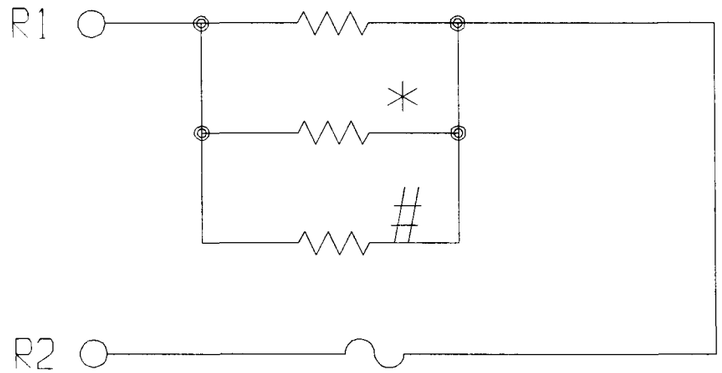
2" MIN AIR CLEARANCE
BOTH ENDS

SIZE	"U"	"V"	"X"	"Y"	"Z"
A	10.25 (26,0)	11.00 (28,0)	18.50 (47,0)	17.75 (45,1)	10.00 (25,4)
B	10.25 (26,0)	11.00 (28,0)	22.50 (51,2)	21.75 (55,2)	10.00 (25,4)
C	13.00 (33,0)	14.50 (36,8)	41.00 (104,2)	40.00 (101,6)	11.00 (28,0)

DIMENSIONS IN INCHES (CM)

APPLICATION		CONTRACT NO.		SWEO CONTROLS INC.
NEXT ASSEMBLY	DASH NO.			BELLEVUE, WA 98005
		PREPARED D. ROUSSEAU	DATE 11/2/87	OUTLINE AND MOUNTING SINGLE AXIS
		CHECKED R. DETERING	DATE 11/2/87	
		APPD.	DATE	SIZE D | FSCM NO. 45586 | 7153 | B
		APPD.	DATE	SCALE NONE | SHEET 1 OF 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

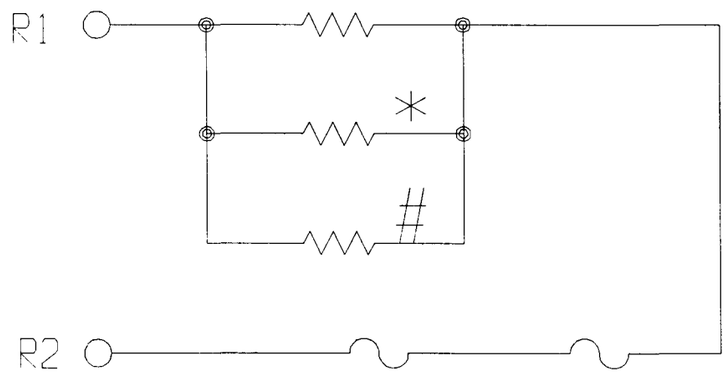


LOW VOLTAGE UNITS

* USED ON: 0007002, 0007012, 0007003 & 0007013 ONLY

\# USED ON: 0007003 & 0007013 ONLY

LOW VOLTAGE REGEN KITS			
PART NO.	RESISTORS	EQUIV. RESISTANCE	MAX DISSIPATION
0007001	1 x 10	10	300W
0007002	2 x 20	10	600W
0007003	3 x 40	13	900W
0007011	1 x 6	6	300W
0007012	2 x 12	6	600W
0007013	3 x 20	6.7	900W



HIGH VOLTAGE UNITS

* USED ON: 0007022, 0007032, 0007023 & 0007033 ONLY

\# USED ON: 0007023 & 0007033 ONLY

HIGH VOLTAGE REGEN KITS			
PART NO.	RESISTORS	EQUIV. RESISTANCE	MAX DISSIPATION
0007021	1 x 20	20	300W
0007022	2 x 40	20	600W
0007023	3 x 60	20	900W
0007031	1 x 12	12	300W
0007032	2 x 25	12.5	600W
0007033	3 x 40	13	900W

SWEO CONTROLS INC.

REGEN KIT INSTALLATION DWG.

DRAWN	SIZE	FSCM NO.	DWG NO.	REV
D. ROUSSEAU	B	45586	0700	
APP'D.	SCALE 1:1		SHEET 1 OF 1	