ELITE®
D.C. MOTOR CONTROL

Instruction Manual

Models

E06200-000
E06250-000
E06300-000
E12200-000
E12250-000
E12300-000

CAROTRON
Driven by Excellence
D.C. DRIVES, A.C. INVERTERS,
SOLID STATE STARTERS, SYSTEM INTERFACE
CIRCUITS AND ENGINEERED SYSTEMS

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1 General Description

The Elite® series of D.C. motor controls provide full range speed and torque control of 5-300 HP D.C. motors rated for NEMA type "C" power supplies. The E06000 series for non-regenerative applications and the E12000 regenerative series are offered in compact panel mounted assemblies. There are ten basic models in each series. Please refer to the Elite® 5-150 HP manual for information on the lower HP drives.

Each model is easily programmed for operation on 230 VAC, 380 VAC and 460 VAC line supplies. 230 VAC input models supply variable armature voltage up to 240 VDC and a fixed field supply of 150 VDC. 380 VAC input models supply variable armature voltage up to 415 VDC and a fixed field supply of 230 VAC. 460 VAC input models supply variable armature voltage up to 500 VDC with a fixed field at 300 VDC. All models feature a field economy circuit to automatically reduce the field supply voltage 35% when stopped for a time period adjustable by the customer from 1 minute to 3 minutes.

Semiconductor line fuses are provided for A.C. line protection with auxiliary line fuses for optional equipment and the field supply. Also provided is fuse protection for the 115 VAC control voltage input.

Standard relay logic interfaces with customer supplied operators for Emergency Stop, Ramp Stop, Run, Jog, and Forward/Reverse direction control on the E12000 regenerative models.

The E12000 series regenerative models provide full four quadrant operation. This means direction of motor rotation can be electronically reversed without switching the motor contactor and that motoring or braking torque can be supplied in both the forward and reverse directions.

Available options include contactor run/brake chassis models, braking resistors, a disconnect switch, blower starters, and enclosures. Also a drive circuit monitor, model DCM100-000, is available to assist in set-up and troubleshooting by plugging into a Control Board connector to easily access 20 separate signals.

Features

- Programmable for 230, 380 or 460 VAC 3 phase line input
- Insensitive to phase rotation of A.C. input
- Full 10 ampere rated field supply with provisions for interfacing the Field Loss circuit to an external field supply or regulator
- Automatic Field Economy with customer adjustable "delay after stop" to reduce "idling" field voltage by 35%
- Current transformers for isolated armature current sensing
- High impedance isolation for armature and line voltage sensing
- Electrically isolated power modules rated at 1400 volts PIV and 1000 volts/microsecond DVDT
- Individual SCR R-C networks for transient protection
- Semiconductor line fuses for power circuit protection
- Thermostatically controlled fan to extend life of the fan
- Latching FAULT logic for safety shutdown with form "C" contact output and LED indicators for Phase Loss, Field Loss, Heatsink Overtemp and Overcurrent.
- 5 jumper selectable armature current ranges for each model to match motor rated armature current
- Timed Foldback current limiting and Overcurrent Trip with four programmable time periods. Allows operating current up to 150% of selected current range for chosen time period; then after time period, 15, 30, 45 or 60 seconds, "folds back" current to 112%. Continued operation with load sustained at 105% current for the chosen time period, 1 min 15 sec, 2 min 30 sec, 3 min 45 sec or 5 minutes, will result in Overcurrent Trip.
- Control of positive and negative (regen models only) motor torque from external pot or voltage reference
- Lockout of either direction of motor rotation from external contact (reverse on regen models only)
- Independently adjustable linear acceleration and deceleration for both forward and reverse directions with two ranges, 1-8 seconds and 8-60 seconds for each.
- Speed feedback is jumper selectable for Armature Voltage , D.C. Tachometer voltage (7,50 or 100 V/1000 RPM), A.C. Tachometer voltage (45 or 90 V/1000 RPM) or Digital Encoder (300 PPR)
- D.C. Tachometer voltage is insensitive to po-

larity

- 12 VDC @ 100mA rated encoder power supply
- Summing input for auxiliary input signals with on-board trim pot for scaling and jumper selection for polarity
- Buffered armature current signal output
- Buffered velocity signal output
- Buffered velocity reference signal output
- Inner current loop type control circuit for responsive and precise control of motor speed and torque
- Terminal strip access to velocity loop output and current loop input for versatile control functions.
- 115 VAC logic for customer operator interface
- Zero speed logic for controlled ramp-to-stop (braking torque supplied by regen models only)
- Jog Delay circuit to allow rapid jogging without de-energizing armature contactor to give longer contactor life
- Additional LED's for operating status, Run, Jog, Zero speed and Foldback
- All important adjustment potentiometers mounted on de-pluggable "Personality Board" to allow Control board replacement while preserving crucial set-up parameters. Critical pots are multiturn and common customer adjustments are single turn with a knob
- Multilevel construction with hinged cover and sub-panel allows ready access to all printed circuit boards, fuses and power components for ease of service and replacement

2 Specifications

2.1 Electrical

A.C. INPUT - 3 PHASE SUPPLY

- 230 VAC ± 10%, 3 phase, 50/60 Hz ± 2 Hz
- 380 VAC ± 10%, 3 phase, 50/60 Hz ± 2 Hz
- 460 VAC ± 10%, 3 phase, 50/60 Hz ± 2 Hz

A.C. INPUT - SINGLE PHASE CONTROL VOLTAGE SUPPLY

- 115 VAC ± 10%, 1 phase, 50/60 Hz ± 2 Hz

ARMATURE OUTPUT

- 0 to 240 VDC @ 230 VAC input
- 0 to 415 VDC @ 380 VAC input
- 0 to 500 VDC @ 460 VAC input

FIELD OUTPUT

- 150 VDC,10 amps max @ 230 VAC input
- 230 VDC,10 amps max @ 380 VAC input
- 300 VDC,10 amps max @ 460 VAC input

NOTE: With drive stopped, Field Economy function reduces field voltage by 35% after adjustable time delay

ACCESSORY OUTPUTS

- Power Supplies

  +12 VDC @ 100 mA encoder supply
  +10 VDC @ 5 mA auxiliary speed reference supply
  -10 VDC @ 5 mA auxiliary speed reference supply
  +7.5 VDC @ 5 mA current reference supply
  -7.5 VDC @ 5 mA current reference supply

- Buffered Signal Outputs

  ±10 VDC Total Reference Setpoint
  +5 VDC Motor Speed Signal
  ±5 VDC Armature current Signal

- FAULT relay contact output: form "C", 3 amps max
- Armature Contactor Coil output : Circuit rated at 10 amps max; actual current available dependent on Control Voltage Supply transformer rating
- Auxiliary 3 phase output, fused at 10 amperes per leg

HORSEPOWER RANGE : NON-REGEN MODELS

- E06200-000: 340 Amps; 100 HP @ 240 VDC, 200 HP @ 500 VDC
- E06250-000: 425 Amps; 125 HP @ 240 VDC, 250 HP @ 500 VDC
- E06300-000: 510 Amps; 150 HP @ 240 VDC, 300 HP @ 500 VDC

HORSEPOWER RANGE : REGEN MODELS

- E12200-000: 340 Amps; 100 HP @ 240 VDC, 200 HP @ 500 VDC
- E12250-000: 425 Amps; 125 HP @ 240 VDC, 250 HP @ 500 VDC
- E12300-000: 510 Amps; 150 HP @ 240 VDC, 300 HP @ 500 VDC

SPEED REGULATION

- Armature Feedback: ± 1% of base speed
- Tachometer Feedback: ± 0.5% of base speed
- Encoder Feedback: ± 0.5% of base speed

TORQUE REGULATION

- ±2% of range selected

SPEED RANGE

- 20:1 motor dependent

TEMPERATURE RANGE

- Chassis : 0 to 55° degrees C
- Enclosed : 0 to 40° degrees C

ADJUSTMENTS : FUSE BD. - ALL MODELS

- Delay Time

ADJUSTMENTS : E06000-000 SERIES PERSONALITY BOARD

- P1, Velocity Integral
- P2, Velocity Proportional
- P3, I (current) Integral
- P4, I (current) Proportional
- P5, Positive I (current) Limit
- P6, I.R. Comp
- P7, Sum Trim
- P8, Integral Null
- P9, Max Speed
- P10, Accel Rate
- P11, Decel Rate
- P12, Jog Speed
- P13, Min Speed

ADJUSTMENTS : E12000-000 SERIES PERSONALITY BOARD

- P1, Velocity Integral
- P2, Velocity Proportional
- P3, I (current) Integral
- P4, I (current) Proportional
- P5, Positive I (current) Limit
- P6, Negative I (current) Limit
- P7, I.R. Comp
- P8, Sum Trim
- P9, Integral Null
- P10, Fwd Max
- P11, Fwd Accel
- P12, Rev Accel
- P13, Jog Speed
- P14, Rev Max
- P15, Fwd Decel
- P16, Rev Decel

2.2 Physical

Refer to Figure 1 for size and mounting dimensions. The Elite® control provides clearance holes for 3/8 inch mounting hardware. Shipping weight of all basic models is 170 lbs.

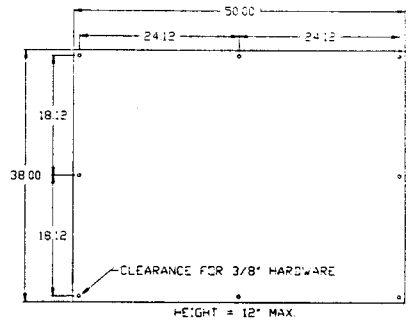


FIGURE 1

3 Installation

3.1 Control Installation

Elite® motor controls require mounting in an upright position in an area that will permit adequate airflow for cooling and ready access for making connections and for servicing.

Because cooler air is drawn in from the bottom and exhausted from the top, these areas should be kept clear for about a six inch distance. Stacking of controls with one mounted above the other should be minimized to so that the upper control is not ventilated with hot exhaust air from the lower control.

Enclosures should be sized to provide adequate surface area for dissipating heat or provided with forced ventilation with outside air from a duct system or enclosure fan. They should be mounted to a cool surface not exposed to heat generated by nearby equipment.

Excess ambient temperatures within enclosures can reduce the life expectancy of electronic components and cause heatsink Overtemperature fault on the Elite® control. Contact Carotron for assistance in sizing enclosures for particular horsepower ratings.

3.2 Wiring Guidelines

To prevent electrical interference and to minimize start-up problems, adhere to the following guidelines.

Make no connections to ground other than the designated grounding connector located in the upper right corner of the drive panel.

Use fully insulated and shielded cable for all signal wiring. This includes all potentiometer

(pot), tachometer, encoder, and summing input wires. The shield should be connected at one end only to circuit common at terminals TB2B-13, 15 or 21. The other end of the shield should be clipped and insulated to prevent the possibility of accidental grounding.

Signal level wiring such as listed above should be routed separately from high level wiring such as armature, field, operator control and relay control wiring. When these two types of wire must cross, they should cross at right angles to each other.

Any relays, contactors, starters, solenoids or electro-mechanical devices located in close proximity to or on the same line supply as the motor control should have a transient suppression device such as an MOV or R-C snubber connected in parallel with its coil. The suppressor should have short leads and should be connected as close to the coil as possible.

4 Terminal Connections & Functions

4.1 A.C. Power Connections and Fusing

The semiconductor fuse holder terminals L1, L2 and L3 are the line input terminals for the SCR power bridge and for the Fuse Board. These field wiring terminals should be torqued 192 in-lbs. Carotron recommends that customers install the wiring lug under the fuse, removing the flat washers under the fuse as necessary. The semiconductor fuses provide protection for the power bridge and armature circuit only and are sized according to the armature current rating of the control. See the Spare Parts listing for recommended fuse and wiring lug sizes.

Jumper J1 selects the proper line input level. Refer to Section 5.1 for further information.

The Fuse Board provides separate fusing of the three phase line supply. Inputs to these fuses are at factory wiring terminals TB4-1, 2 and 3.

The motor field voltage supply, control transformer primary and customer auxiliary outputs at TB3-6, 7 and 8 are protected by 10 ampere, 500 VAC rated fuses. The primary of the control voltage transformer should be connected to TB3-7 and 8.

An additional 5 ampere, 250 VAC fuse is connected to the 115 VAC input at TB3-1 and 2 for the control transformer secondary to protect the AC relay/contactor logic and the heatsink fan. Further protection is provided for the power supplies by a 0.5 ampere, 250 VAC fuse on the Power Supply Board.

Refer to Figures 2 and 3 for A.C. power connections. Shown are 230 and 460 VAC three phase power and the 115 VAC single phase control voltage supply connections.

NOTE: Carotron recommends the use of three phase DIT, drive isolation type transformers. While Elite® controls do not require these transformers for proper operation, they can be helpful in reducing the effects of line transients on this control and generated by this control on other products and can provide fault current limiting in the event of severe motor or control failure.

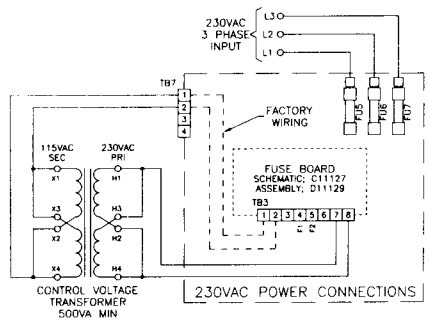


FIGURE 2

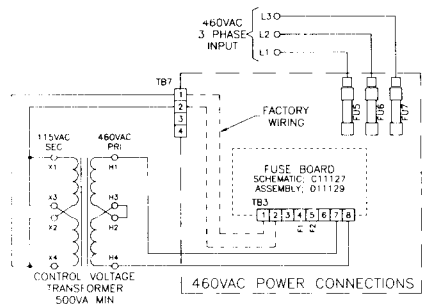


FIGURE 3

Table 1 on the next page is meant as a general guide in sizing line supply transformers and wiring.

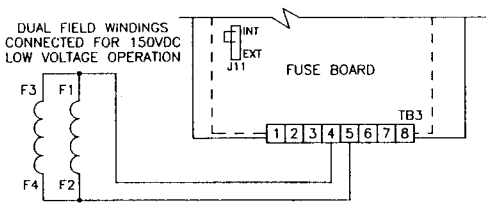
TABLE 1: THREE PHASE LINE CURRENT AND TRANSFORMER RATINGS

Drive Model	Motor HP	Arm Volts	Approx. Full Load Line Amps	3 Phase DIT KVA Rating
E06200-000 E12200-000	100	240	282	118
E06250-000 E12250-000	125	240	354	145
E06300-000 E12300-000	150	240	426	175
E06200-000 E12200-000	200	500	283	220
E06250-000 E12250-000	250	500	353	275
E06300-000 E12300-000	300	500	423	330

4.2 Motor Connections

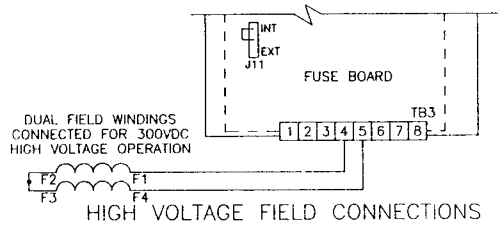
FIELD

Most motor fields consist of two windings that are connected in parallel for 150 VDC operation and in series for 300 VDC operation. Refer to Figures 4 and 5 for typical connections to TB3, terminals 4 and 5. The winding leads are individually marked and have a polarity that must be observed for proper and safe operation. Since direction of rotation is controlled by field polarity as well as armature polarity, it is sometimes more convenient to use the smaller field leads when making corrections to the direction of rotation during initial installation. An energized field should never be switched by relay, contactor, switch or any other manual or electro-mechanical device.



LOW VOLTAGE FIELD CONNECTIONS

FIGURE 4

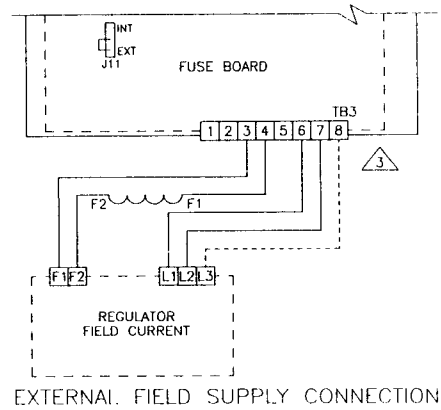


HIGH VOLTAGE FIELD CONNECTIONS

FIGURE 5

Carotron Elite® motor controls are designed to sense field current and will indicate an open circuit in the field windings, wiring or fusing by initiating a Field Loss Fault condition.

The sensing circuit can be interfaced with an external regulator or field supply by connecting its F1 output to TB3-3 as shown in Figure 6.



EXTERNAL FIELD SUPPLY CONNECTIONS

FIGURE 6

WARNING!!! When interfacing with an external field supply, programming jumper J11 must be placed in the EXT position to prevent damage to the Elite® control or external supply.

ARMATURE

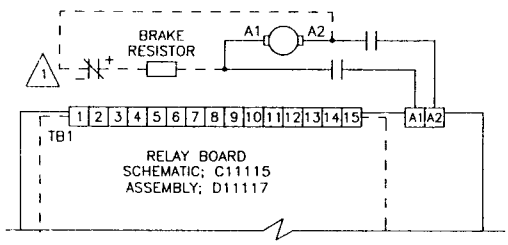
The armature leads are usually the highest current wires associated with the drive and warrant special attention to sizing based on current rating as well as length of run. Extra care should be used where terminations and splices are made. Refer to Table 2 on the next page for typical armature voltage, current, contactor and dynamic braking resistor ratings.

TABLE 2 : ARMATURE CONTACTOR AND DYNAMIC BRAKE RESISTOR RATING

Drive Model	Motor HP	Arm Volts	Arm Amps	Contactor Rating	D.B.Resistor Rating
E06200-000 E12200-000	100	240	340	360 Amps	0.47 Ohms, 4700 W
E06250-000 E12250-000	125	240	425	535 Amps	0.37 Ohms, 5300 W
E06300-000 E12300-000	150	240	510	535 Amps	0.31 Ohms, 7000 W
E06200-000 E12200-000	200	500	326	360 Amps	1.02 Ohms, 6500 W
E06250-000 E12250-000	250	500	405	535 Amps	0.82 Ohms, 11000 W
E06300-000 E12300-000	300	500	510	535 Amps	0.65 Ohms, 14600 W

Figure 7 shows the armature, contactor and brake resistor connections to the A1/A2 terminal block. These field wiring terminals should be torqued to 275 in-lbs. The contactor coil will connect to TB7-1 and 2 as shown in Figure 8.

NOTE: When present, the S1 and S2 for the SERIES field winding is placed in series with the armature leads on the non-regenerative models. It should not be used with the E12000 Series regenerative models and the leads should not be connected and should be individually insulated. On non-regenerative models the series field winding polarity must be kept at the same polarity as the shunt field winding, i.e. F1 and S1 the same, F2 or F4 and S2 the same.



CONTACTOR AND D.B. RESISTOR CONNECTIONS

NOTES:

1. POLARIZATION NOT APPLICABLE TO REVERSING MODELS

FIGURE 7

MOTOR THERMOSTAT

Most motors include "J" or "P" leads that connect to an internal normally closed thermostat. Connecting at TB1-1 and 2 as shown in Figure 8 will allow a motor over-temperature condition to shut down the control as in an Emergency Stop condition.

MOTOR BLOWER

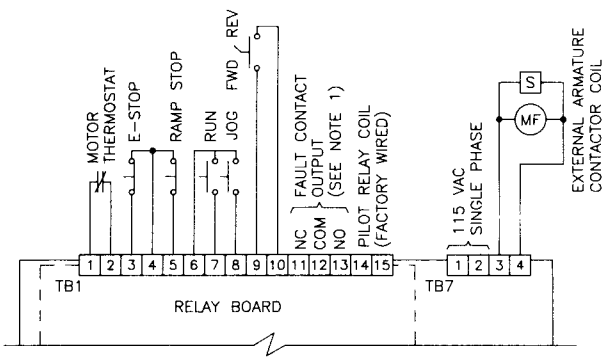
When used, motor blowers should operate any time the motor field is energized. This operation is given by connecting to the auxiliary line outputs at TB3-6, 7 and 8 as per Figure 2 and 3 depending on the level of input voltage.

4.3 Operator Connections

All push-button and selector operator contacts connect to TB1 located on the RELAY BOARD. The armature contactor coil connects to terminal strip TB7-3 and 4. Refer to Figure 8 for these connections. All items connected to TB1 will be controlling or controlled by 115 VAC logic and must be rated accordingly. A.C. current levels are 5 amps or less.

TB1 TERMINALS 1-4

When operated, the motor thermostat and the Emergency Stop contacts at terminals 1 through 4 will immediately clamp all control signals on the control board. The armature contactor will also de-energize to disconnect the armature from the bridge output. Motor stopping time is determined by inertia and friction characteristics of the load and can be decreased by use of a brake resistor. Refer to Table 2 for recommended resistor values and Figure 7 for connections.



NOTES:
1. INTERNAL FAULT RELAY IS NORMALLY ENERGIZED. UPON FAULT CONDITION, THE CONTACTS WILL BE IN THE DE-ENERGIZED POSITIONS, AS LABELED.

OPERATOR AND COIL CONNECTIONS

FIGURE 8

TB1 TERMINALS 4 AND 5

The Ramp Stop contact at terminals 4 and 5 will cause the motor to ramp to stop in the time set by the DECEL pot(s) and jumpers J8 and J9 on the CONTROL BOARD. Refer to section 5.1 for additional information on the programming jumpers. The deceleration ramp is linear. For example, ramping to stop from 50% speed will take 1/2 the stopping time from full speed. The ZERO SPEED circuit works in this stopping mode to hold the armature contactor energized until armature voltage decreases to approximately 5% of rated output.

NOTE: On the non-regen E06000 Series models, deceleration time can be controlled only when the desired stopping time is to be longer than the time inherently caused by the friction or load dynamics. Since negative running torque is not provided, decel time on these models can only be extended, not shortened.

TB1 TERMINALS 6 AND 7

Momentarily closing the RUN contact from 6 to 7 will cause the motor to accelerate linearly to the external Speed pot setting with time controlled by the accel pot(s) and the J8 and J9 jumpers.

TB1 TERMINALS 6 AND 8

Closing the JOG contact from 6 to 8 will accelerate the motor at a fixed exponential rate to the JOG pot setting. De-energization of the contactor by opening the contact can be instant or delayed 3-4 seconds by selecting the position of J12 on the RELAY BOARD. This can extend the mechanical life of the contactor in frequent jogging applications. Refer to Section 5.1 for J12 explanation.

TB1 TERMINALS 9 AND 10

On E12000 Series controls, direction of rotation is controlled by the FWD/REV selector operator at terminals 9 and 10. No connection gives reverse direction while forward is selected by connecting these terminals. Changing the direction command while running in the run or jog mode will cause the motor to immediately decelerate to zero speed and then accelerate to speed in the newly selected direction. The rate of accel and decel is internally fixed to a couple of seconds for the jog mode and is controlled by the ACCEL and DECEL pots in the RUN mode. See Section 5.2 for additional information on the potentiometers.

These terminals are not used on E06000 Series models.

TB1 TERMINALS 11, 12 AND 13

The FAULT contact outputs at terminals 11, 12 and 13 are part of the FAULT relay that supplies 115 VAC to all relay logic and customer wiring connected to TB1. This voltage is supplied from TB1-1 when the FAULT relay is in its normally energized state. When a fault condition occurs, the relay de-energizes. Note that the contacts at terminals 11,12 and 13 are labeled for their de-energized, fault mode condition. Refer to Section 7.1 for more information on FAULT CONDITIONS.

TB1 TERMINALS 14 AND 15

These terminals are factory wired to the external pilot relay which provides the 115 VAC to the armature contactor coil at TB7-3 and 4.

TB7 TERMINALS 1 AND 2

Single phase 115 VAC is supplied to the drive at these terminals. Please refer to Section 4.1 for more information on A.C. Power Connections.

TB7 TERMINALS 3 AND 4

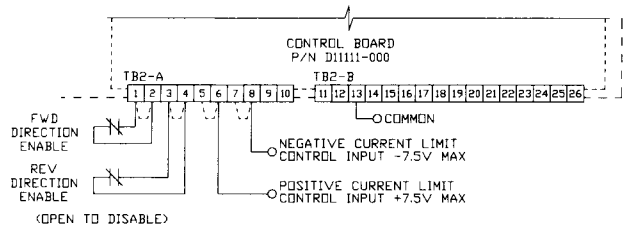
The 115 VAC contactor coil connects to terminals 3 and 4. The external pilot relay contacts supplying this voltage are rated at 10 amperes inductive load at 115 VAC. The current available depends on the rating of the customer supplied control voltage transformer.

4.4 Signal Wiring Connections

All signal level wiring connects to TB2A and TB2B on the CONTROL BOARD. Observe the use of shielded cable and other wiring guidelines detailed in Section 3.2.

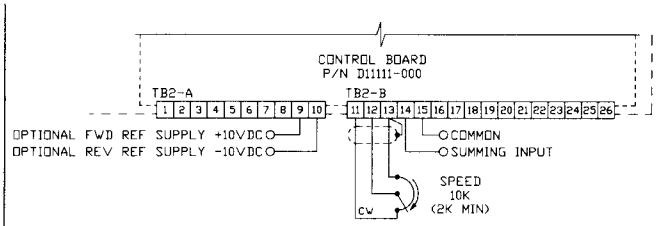
TB2A TERMINALS 1-4

Terminals 1-4 are FWD/REV Direction Enable control inputs for the regenerative E12000 Series model controls. Refer to Figure 9.



AUXILIARY CONTROL SIGNALS

FIGURE 9



REFERENCE INPUT CONNECTIONS

FIGURE 10

They are normally jumpered; 1 to 2 for forward direction and 3 to 4 for reverse on regenerative models; or are contact controlled when external lockout of direction is required. The contact should be rated for 12 VDC @ 20 mA, inductive load.

Example: limit switch control of a traverse operation.

NOTE: The run mode motoring function only is disabled, i.e. the E12000 Series models can still provide regenerative braking torque for either direction. Jog mode operation is not affected by these enable controls.

TB2A TERMINALS 5-8

Terminals 5-8 are current limit control inputs to allow limiting motor current by an external voltage signal. Terminals 5 and 7 are +7.5 VDC and -7.5 VDC respectively and are normally connected to terminals 6 and 8 respectively. The 7.5 volt levels correspond to 150% current level and are trimmed by the POS and NEG CURRENT LIMIT pots on the E12000 Series PERSONALITY BOARD. The voltage applied to terminals 6 or 8 should never be allowed to exceed 7.5 VDC. See Section 7.3 for more information.

NOTE: Terminals 7 and 8 are not used on the E06000 Series models.

TB2A TERMINALS 9 AND 10

Terminals 9 and 10 are the auxiliary ±10 VDC reference supply outputs and are not normally used. Normal operation of regenerative models uses the FWD/REV SELECTOR and DIR relay on the RELAY BOARD to control the reference (speed pot) voltage polarity and therefore the direction of motor rotation.

CAUTION: These supplies are made available for specially engineered systems and when used directly can override normal direction control signals. Consult Carotron for additional information.

TB2B TERMINALS 11, 12 AND 13

The speed reference potentiometer connects to 11, 12 and 13. Refer to Figure 10. Terminal 11 is the ±10 VDC reference voltage supply selected by the FWD/REV operator. Terminal 11 is always +10 VDC on the non-regenerative models.

Terminal 12 takes the trimmed reference from the pot wiper to the inputs of the accel/decel control circuits. This is also the signal input that is further controlled by the DIRECTION ENABLE jumpers or contacts at terminals 1-4.

Terminal 13 along with 15 and 21 are circuit common of the isolated control circuit. The pot ccw terminal and the shield for the pot cable connect to 13.

TB2B TERMINALS 14 AND 15

Terminal 14 is the SUMMING INPUT terminal. A signal applied between 14 and circuit common at 15 can be trimmed by the Sum Trim pot on the PERSONALITY BOARD and be made to add or subtract from the run and jog mode reference signals. The combination of the summing signal and the speed reference gives a TOTAL REFERENCE SETPOINT which is internally limited to give a maximum armature output voltage no greater than 108% of the control rating.

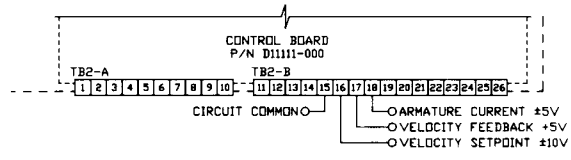
The SUM TRIM pot can provide a minimum speed function by connecting TB2A-9 to TB2B-14 and placing J2 in the ADD position.

CAUTION: Because the Elite® E12000 Series regenerative models are electronic reversing type controls in which direction of motor rotation is controlled by the polarity of the TOTAL REFERENCE SETPOINT, a SUMMING Input signal which is subtracted from and exceeds the speed reference input can cause the direction of rotation to change without switching the FWD/REV selector operator.

Refer to Section 5.1 - J2 Sum Function for additional information on using the SUMMING Input.

TB2B TERMINALS 16, 17 AND 18

Buffered outputs for monitoring control operation are provided at terminals 16, 17 and 18. These outputs can source up to 10 mA current each and are used by measuring from circuit common at terminals 13, 15 or 21. Refer to Figure 11.



BUFFERED MONITORING OUTPUTS

FIGURE 11

Terminal 16 is the TOTAL REFERENCE SETPOINT and equals 10.0 VDC at 100% speed reference command. Positive polarity indicates a forward direction command (A1 motor terminal positive with respect to A2 motor terminal) and negative indicates a reverse command.

Terminal 17 is the VELOCITY FEEDBACK signal and equals +5.0 VDC at 100% motor speed. This voltage is always positive regardless of rotation direction and source of feedback, i.e. armature voltage , tachometer or encoder signal.

Terminal 18 is the armature current signal and equals 5.0 volts at 100% of the ARMATURE AMPS range selected by J4 on the control board. Positive polarity indicates positive motor current and negative polarity indicates negative motor current. Refer to Table 3 and Section 5.1 for additional information on the armature current signal and how it is programmed.

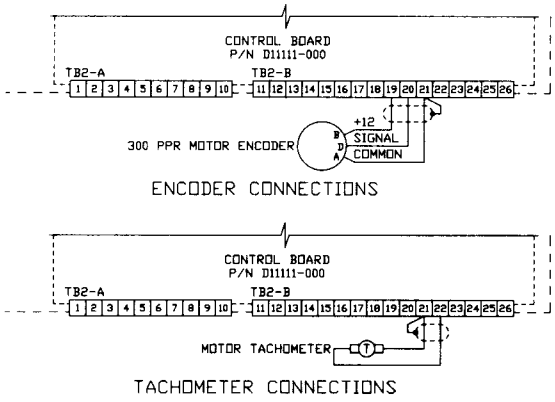


FIGURE 12

TB2B TERMINALS 19, 20, 21 AND 22

When used for velocity feedback, a 300PPR encoder is connected to terminals 19, 20 and 21. Carotron encoder PN TAC008-000 readily mounts to motors using a standard XPY tachometer kit and interfaces directly to these terminals. Refer to Section 5.1 and Figure 12 for more information on feedback selection and connections.

Terminal 19 is the +12 VDC encoder supply. Terminal 20 is the signal input. Terminal 21 is the circuit common connection for the common lead and the cable shield.

For AC or DC tachometer feedback, connect the tachometer leads to terminals 21 and 22. These terminals are not polarity sensitive.

Terminal 21 will be the shield and one signal lead. Terminal 22 will be the second signal lead. Refer to Section 5.1 for information on selecting and programming the tachometer input level. Refer to Figure 12 for connections.

TB2B TERMINALS 23 AND 24

When required, an external FAULT RESET contact can be connected to terminals 23 and 24. This switch parallels the RESET on the CONTROL BOARD and resets the control from a fault condition.

NOTE: The control does not automatically restart when reset from a fault condition.

TB2B TERMINALS 25 AND 26

These terminals are normally jumpered in the speed regulator mode. However, Motor Torque instead of Speed can be regulated by controlling armature current instead of voltage. This is done by directly connecting a torque reference signal to the C.L. (Current Loop) input terminal, TB2B-26. This must be a voltage signal no greater than ±10 volts.

With Current Range jumper, J4 in the 100% position and Current Limit pots P5 and P6 at maximum, a 5 volt input will equal 100% motor torque/current output.

The Over Current fault and the current Foldback functions are fully operational in the Direct Current Loop Access mode.

NOTE: There will be no direct armature voltage control in this mode. Since the control will supply whatever voltage is necessary to set a current and torque level, there is the possibility of over-speeding the motor in applications where the web could break and reduce or eliminate the torque loading. Where over-speeding could cause damage, a web breakage detector or speed sensing relay should be used to stop the motor control. Please consult the factory on using this specially engineered function.

5 Programming & Adjustments

5.1 Programming Jumpers

Programming jumpers J1 through J10 are located on the control board.

J1 ARM VOLTS

The only programming required for converting an Elite® control from one 3 phase input voltage to another is the proper placement of J1. Because maximum armature voltage is determined by the A.C. line voltage level, this jumper selection must correspond to the line level as follows : 240 V for 230 VAC line, 415 V for 380 VAC line and 500 V for a 460 VAC line.

J2 SUM FUNCTION

The function of the SUMMING signal applied to TB2B-14 is controlled by J2. The signal is trimmed by the Sum Trim pot and combined with the speed reference to make the TOTAL REFERENCE SETPOINT and will add or subtract from it depending on the position of J2 and the direction command on regen models.

A positive signal from the speed or jog pot normally calls for forward rotation of the motor. On the regenerative models, negative polarity selects reverse direction. With Add selected at J2, a positive SUMMING signal will add to a positive (forward) reference. A negative SUMMING signal would subtract.

NOTE: With Add selected, a negative SUMMING signal greater than the positive reference would cause a net negative TOTAL REFERENCE SETPOINT and would cause REVERSE rotation even with forward direction selected. The same situation could occur if the SUMMING signal was positive and the SUBTRACT position was selected at J2. This logic applies regardless of the direction command by the FWD/REV selector.

With ADD selected, like polarity signals add; unlike polarities subtract from each other with the greatest signal having control of direction. With SUBTRACT selected, like polarities subtract from each other and unlike polarities add.

J3 JOG/SUM SELECT

As explained in the description of J2, the SUMMING signal is normally combined with both the RUN and JOG speed reference signals. Placing J3 in the (NOT) JOG/SUM position indicated by JOG/SUM with a bar drawn over it, prevents the SUMMING signal from being combined with the JOG reference.

J4 ARM AMPS

Each Elite® model has a full load current rating as listed in Section 2.0 Specifications under "Horsepower Range." Control operation, current limiting and overcurrent sensing are optimized for this rated current level when J4 is in the 100% position. Armature current at the 100% rating is scaled to 5.0 VDC CURRENT FEEDBACK level at the internal current processing circuit and at the BUFFERED CURRENT SIGNAL output at TB2B-18. When a motor rated at lower full load current level is used, J4 allows scaling of the

TABLE 3 : ARMATURE CURRENT RANGE PROGRAMMING

Drive Model	Motor HP	Arm Volts	Arm Amps	J4 Position and Equiv. Amp. Rating
E06200-000 E12200-000	60 75 100	240	206 256 340	60% - 204 80% - 272 100% - 340
E06250-000 E12250-000	125	240	425	100% - 425
E06300-000 E12300-000	150	240	510	100% - 510
E06200-000 E12200-000	125 150 200	500	203 245 326	60% - 204 80% - 272 100% - 340
E06250-000 E12250-000	250	500	405	100% - 425
E06300-000 E12300-000	300	500	510	100% - 510

lower signal in 20% increments to maintain a 5 volt current feedback level.

Example: A 340 ampere rated model E12200-000 control operated on a 230 VAC 3 phase supply connected to a 60 HP, 206 ampere motor should have J4 placed in the 60% position. This would give the control an equivalent 204 ampere rating.

Refer to Table 3 for typical control and motor ratings and suggested placement of J4.

J5 VEL FEEDBACK

Velocity (speed) feedback can come from either of several sources.

AFB selects armature voltage feedback, and must be selected when no other feedback device such as a tachometer or an encoder is to be used. Even then it should be selected during initial setup until proper feedback from the other device is verified. The AFB level is selected by J1.

TFB is selected when an A.C. or D.C. Tachometer on the motor being controlled is used for feedback. This is not to be confused with a follower tachometer used on another motor or location to provide a speed reference to the Elite® control. See J6 jumper description for tachometer voltage programming information.

EFB selects feedback input from a 300 PPR encoder.

J6 TACH VOLTS/1000RPM

When TFB is selected by J5, the J6 jumper position should be placed to match the nameplate output of the tachometer.

The voltage given reflects the tachometer output at 1000 RPM. The 7 position is for 7 volts per 1000 RPM D.C. tachometers. The 45-50 position is for 45 V/1000 RPM A.C. tachometers and 50 V/1000 D.C. tachometers. The 90-100 position corresponds to higher A.C./D.C. tachometer ratings.

J7 OVERCURRENT

The Elite® series controls have several armature current operated protection circuits. J7 controls the operating time of the Current FOLDBACK and the OVERCURRENT FAULT circuits. The J7 values refer to the FOLDBACK/OVERCURRENT FAULT times in seconds.

The control will temporarily allow motor currents up to 150% of the range selected by J4 - refer to Table 3. When current demanded by the load has exceeded 105% of the range for the J7 time period ahead of the slash, the control will FOLDBACK or clamp the current to a maximum of 112%. Continued excessive current for the time period behind the slash will cause the control to initiate an OVERCURRENT FAULT condition.

Example: In the previous example given in the description of J4, the control was scaled for a full load rating of 204 amps. With J7 in the 15/75s position, the FOLDBACK circuit will allow over 214.2 (105%) armature amps for 15 seconds, then current is limited up to 228.5 (112%) amps for 75 additional seconds after which an OVERCURRENT FAULT will occur. During these time periods any reduction in current below 105% will reset the FOLDBACK/OVERCURRENT timers until the 105% level is again exceeded.

NOTE: Refer to Section 7.1 for more information on FAULT CONDITIONS.

J8 FWD TIME

J8 provides two ranges of Acceleration and deceleration time for the FWD ACCEL and FWD DECEL pots on the PERSONALITY BOARD. The selected range, 1-8 or 8-60 seconds will be the same for the forward direction pots.

J9 REV TIME

J9, similar to J8, provides two time range selections for the REV ACCEL and REV DECEL pots. The time range selected will be the same for both reverse direction pots.

NOTE: J9 is not used on the E06000 series, non-regen models.

J10 FIELD LOSS BYPASS

Reference Section 4.2 - Field. The Elite® model controls are able to sense field current produced from the internal or an external field supply circuit.

For applications where field current sensing is not appropriate, the field loss signal must be bypassed to prevent a FIELD LOSS FAULT condition. This is done by moving J10 from NORMAL to the BYPASS condition.

J11 INT/EXT

J11, located on the FUSE BOARD, is used to interface the field current sensing circuit with an external field supply. Refer to Section 4.2 Motor Connections - Field and Figure 6.

WARNING!!! When interfacing with an external field supply, programming jumper J11 must be placed in the EXT position to prevent damage to the Elite® control or external supply.

J12 JOG DELAY

J12 is located on the RELAY BOARD. Refer to Section 4.3 Operator Connections - Terminals 6 and 8. De-energization of the contactor by opening the JOG operator contact can be instant or delayed 3-4 seconds by selecting the position of J12. The NORMAL position gives the 3-4 second drop-out delay and the DEFEAT position causes immediate de-energization of the armature contactor after "jogging."

5.2 Adjustment Potentiometers

The CONTROL BOARD adjustments for all Elite® models are listed in Table 4. Note that the negative current and reverse adjustments are not present on the E06000, non-regenerative, models, and min speed is not present on E12000 models.

TABLE 4: CONTROL BOARD ADJUSTMENTS

E12/ [E06] Adjustment Name	E12000 Person. Board Label	E06000 Person. Board Label
VELOCITY INTEGRAL	P1	P1
VELOCITY PROPORTIONAL	P2	P2
I (CURRENT) INTEGRAL	P3	P3
I (CURRENT) PROPORTIONAL	P4	P4
POSITIVE I (CURRENT) LIMIT	P5	P5
NEGATIVE I (CURRENT) LIMIT	P6	N.A.
I.R. COMP	P7	P6
SUM TRIM	P8	P7
INTEGRAL NULL	P9	P8
FWD MAX [MAX SPEED]	P10	P9
FWD ACCEL [ACCEL RATE]	P11	P10
REV ACCEL	P12	N.A.
JOG SPEED	P13	P12
REV MAX	P14	N.A.
FWD DECEL [DECEL RATE]	P15	P11
REV DECEL	P16	N.A.
MIN SPEED	N.A.	P13

An additional adjustment, DELAY TIME, is located in all models on the FUSE BOARD and is designated P1 on that assembly.

The description of adjustments is divided into sections; the first being the more common customer adjustments and the latter those adjustments with more complex functions.

5.2.1 Common Customer Adjustments

FWD MAX (MAX SPEED)

The FWD MAX is a single turn knob adjust pot that trims the output of the FWD accel/decel circuit. It controls the maximum positive armature voltage or forward speed from 20% to 108% of rated output.

REV MAX

The REV MAX is a single turn knob adjust pot that trims the output of the REV accel/decel circuit. It controls the maximum negative armature voltage or reverse speed from 20% to 108% of rated output.

MIN SPEED

The MIN SPEED is a single turn knob adjust pot. It sets the minimum armature voltage or speed from 0% up to 30% of rated output on E06000 models.

FWD ACCEL

The FWD ACCEL is a single turn knob adjust pot that controls the Acceleration time in the forward direction. Its range is set at 1-8 or 8-60 seconds by the position of J8 on the CONTROL BOARD. Clockwise rotation increases the acceleration time.

REV ACCEL

The REV ACCEL is a single turn knob adjust pot that controls the acceleration time in the reverse direction. Its range is set at 1-8 or 8-60 seconds by the position of J9 on the CONTROL BOARD. Clockwise rotation increases the acceleration time.

FWD DECEL (DECEL RATE)

The FWD DECEL is a single turn knob adjust pot that controls the deceleration time in the forward direction. Its range is set at 1-8 or 8-60 seconds by the position of J8 on the CONTROL BOARD. Clockwise rotation increases the deceleration time.

Note: On the non-regen E06000 Series models, deceleration time can be controlled only when the desired stopping time is to be longer than the time inherently caused by the friction or load dynamics. Since negative running torque is not provided, decel time on these models can only be extended, not shortened.

REV DECEL

The REV DECEL is a single turn knob adjust pot that controls the deceleration time in the reverse direction. Its range is set at 1-8 or 8-60 seconds by the position of J9 on the CONTROL BOARD. Clockwise rotation increases the deceleration time.

JOG SPEED

The JOG SPEED is a single turn knob adjust pot that sets the speed when the JOG button is depressed. Direction is controlled by the FWD/REV selector. Its range is from 0% to 40% of rated output.

POSITIVE I (CURRENT) LIMIT

Positive I Limit is a single turn screwdriver adjust pot used to set the maximum allowable

positive motor current. Clockwise increases the current from 5% up to 150% of the rating programmed by jumper J4. Refer to Table 3 for these ratings. Positive current can be limited in both the forward motoring and reverse braking modes of operation.

NEGATIVE I (CURRENT) LIMIT

Negative I Limit is a single turn screwdriver adjust pot used to set the maximum allowable negative motor current. Clockwise increases the current from 5% up to 150% of the rating programmed by jumper J4. Refer to Table 3 for these ratings. Negative Current can be limited in both the reverse motoring and forward braking modes of operation.

NOTE: An external current limit signal applied at TB2A is trimmed by the I Limit pots. Refer to Section 4. 4 - TB2A Terminals 5 - 8.

I . R . COMP

The I.R. COMPENSATION pot signal is automatically added when AFB is selected by J5. The signal is proportional to load current and is added to the reference to keep speed from dropping with an increase in load. This is not required when a velocity feedback device such as a tachometer or encoder is used. The pot range is O to 6% of the IFB signal and is scaled by J4 ARM AMPS. The amount of compensation required is dependent on motor characteristics and must be adjusted with the actual motor and load used. Refer to Section 6.4 for calibration information.

DELAY TIME

DELAY TIME is a single turn knob adjust pot used to set the time period after the control is stopped before the motor field current is automatically reduced by the FIELD ECONOMY circuit. The pot ranges from 1 to 3 minutes with counter-clockwise rotation increasing time.

5.2.2 Complex Adjustments

These pots are all multiturn (20-25 turns) screwdriver adjustable types.

SUM TRIM

The SUM TRIM pot is used to scale the SUMMING signal applied to TB2B. Refer to Section 4.4 - TB2B terminals 14 and 15 and Section 5.1 J2 Sum Function for a description of this signal and its use.

INTEGRAL NULL

The INTEGRAL NULL can be used to alter control performance when the TOTAL REFERENCE SETPOINT is being rapidly reduced to zero or is maintained at zero with the control started. The high gain of the VELOCITY INTEGRAL circuit can cause direction overshoot or motor creeping under some load conditions. The INTEGRAL NULL counter-acts the high gain by using a limited amount of the current loop output as a negative feedback. This causes a low gain area around zero that eliminates these problems. There is a small trade off in a reduction in regulation.

NOTE: Elite Drives manufactured after Fall '95 incorporate an integral null circuit that is locked out above zero speed. This eliminates the reduction in speed regulation above zero speed.

VELOCITY INTEGRAL

The VELOCITY INTEGRAL is a trimming pot that gives a 20 to 1 change in the velocity loop integral time constant. Clockwise rotation increases the time or decreases the response rate.

VELOCITY PROPORTIONAL

The VELOCITY PROPORTIONAL gives a 4 to 1 change in the velocity loop Proportional gain. Clockwise rotation increases the gain.

The VELOCITY INTEGRAL and VELOCITY PROPORTIONAL signals are summed to produce the TORQUE DEMAND signal.

I (CURRENT) INTEGRAL

The I INTEGRAL is a trimming pot that gives a 10 to 1 change in the current loop Integral time constant. Clockwise rotation increases the time or decreases the response rate.

I (CURRENT) PROPORTIONAL

The I PROPORTIONAL gives a 2 to 1 change in the current loop proportional gain. Clockwise rotation increases the gain.

The I INTEGRAL and I PROPORTIONAL signals are summed to produce the VCO input signal.

5.3 DCM Checkpoints, Circuit Testpoints & Buffered Outputs

TABLE 5: MONITORING OUTPUTS

Signal Being Monitored	DCM Check Point	Test Point Letter	Buffered Output Terminal
+24 VDC	A	TP8	–
-24 VDC	B	TP10	–
+15 VDC	C	TP9	–
-15 VDC	D	TP11	–
+12 VDC RELAY	E	TP4	TB2A-1 & 3
+6 VDC	F	TP2	–
-6 VDC	G	TP3	–
TOTAL REFERENCE SETPOINT	H	TP19	TB2B-16
FWD ACCEL/DECEL	I	TP13	–
REV ACCEL/DECEL (E12000 Series only)	J	TP22	–
SCALED ARMATURE VOLTAGE	K	TP15	TB2B-17 Positive only
SCALED TACHOMETER VOLTAGE	L	TP18	TB2B-17 Positive only
SCALED ENCODER VOLTAGE	M	TP20	TB2B-17 Positive only
VELOCITY INTEGRAL	N	TP17	–
VELOCITY PROPORTIONAL	O	TP14	–
I (CURRENT) INTEGRAL	P	TP12	–
I (CURRENT) PROPORTIONAL	Q	TP16	–
CURRENT DEMAND	R	TP5	–
CURRENT FEEDBACK	S	TP21	TB2B-18
VCO REFERENCE	T	TP6	–
CIRCUIT COMMON	–	TP1, 1A & 7	TB2B-13, 15 &22
CURRENT LOOP ERROR	–	TP23	–

Refer to Table 5 for a listing of the monitoring outputs on the Elite® models.

+24 VDC AND -24 VDC

As unregulated power supplies, these voltages can normally deviate ±4 VDC with line voltage and load variations.

+15, -15, +12 RELAY, +6 AND -6 VDC

These are regulated power supplies that will vary no more than 5% with a ±10% change in line voltage.

TOTAL REFERENCE SETPOINT

Refer to Section 4.4 Terminal TB2B-16 and Section 5.1 J2 Sum Function. The TOTAL REFERENCE SETPOINT equals 10.0 VDC at 100% speed reference command. Positive polarity indicates a forward direction command (A1 motor terminal positive with respect to A2 motor terminal) and negative indicates a reverse command.

FORWARD ACCEL/DECEL

The Forward Accel/Decel circuit output shows the positive RUN reference as rate controlled by the ACCEL and DECEL pots.

REVERSE ACCEL/DECEL

The Reverse Accel/Decel circuit output shows the negative RUN reference as rate controlled by the ACCEL and DECEL pots.

SCALED ARMATURE VOLTAGE

The armature voltage signal selected by J1, 240, 415 or 500 VDC, is scaled to a 5 volt level and used for velocity feedback in the AFB mode, for zero speed sensing and for control of the ACCEL/DECEL circuits. The polarity is same as the armature voltage polarity.

SCALED TACHOMETER VOLTAGE

The tachometer voltage selected by J6 is scaled to a 5 volt level at motor base speed and used for velocity feedback in the TFB mode. The polarity is the same as the armature voltage polarity.

SCALED ENCODER VOLTAGE

The 300 PPR encoder signal is scaled to 5 volts at motor base speed and used for velocity feedback in the EFB mode. The polarity is the same as the armature voltage polarity.

NOTE: The scaled velocity feedback signal selected by J5 is combined with the TOTAL REFERENCE SETPOINT to produce the velocity loop error input. The selected feedback is also precisely rectified and supplied as a positive polarity only BUFFERED VELOCITY FEEDBACK at TB2B-17.

VELOCITY INTEGRAL

This is the velocity loop Integral signal before it is combined with the velocity proportional signal to give the Torque reference signal.

VELOCITY PROPORTIONAL

This is the velocity loop proportional signal before it is combined with the velocity integral signal to give the Torque reference signal .

I (CURRENT) INTEGRAL

This is the current loop integral signal before it is combined with the current proportional signal to give the VCO signal.

I (CURRENT) PROPORTIONAL

This is the current loop proportional signal before it is combined with the current integral signal to give the VCO signal.

CURRENT DEMAND

The Torque reference signal is combined with any CURRENT LIMIT or FOLDBACK signal to give the CURRENT DEMAND.

CURRENT FEEDBACK

The armature current signal is scaled according to the control rating and position of J4, see Table 3. The scaled signal is summed with the CURRENT DEMAND signal to produce the current loop error input.

VCO REFERENCE

The VCO REFERENCE is the precisely rectified current loop output signal and controls the frequency of the oscillator input to the trigger circuit.

CURRENT LOOP ERROR

This signal is produced by summing the CURRENT FEEDBACK and the CURRENT DEMAND signals. It is the input to the current loop.

6 Start-Up Procedure

6.1 Adjustment & Programming Presets

Carotron Elite® controls are all functionally tested and calibrated with motor loads and should require further calibration only to tailor operation for a specific application. The adjustment presets are listed in the event that the condition of the control and its adjustments are unknown or in doubt.

Potentiometer Presets

VELOCITY INTEGRAL	1/3 CCW
VELOCITY PROPORTIONAL	1/3 CCW
I (CURRENT) INTEGRAL	1/3 CCW
I (CURRENT) PROPORTIONAL	1/3 CCW
POSITIVE I (CURRENT) LIMIT	full CW
NEGATIVE I (CURRENT) LIMIT	full CW
I.R. COMP	full CCW
SUM TRIM	full CCW
INTEGRAL NULL	full CCW
FWD MAX [MAX SPEED]	mid-range
FWD ACCEL [ACCEL RATE]	mid range
REV ACCEL	mid-range
JOG SPEED	mid-range
REV MAX	mid-range
FWD DECEL [DECEL RATE]	mid-range
REV DECEL	mid-range
MIN SPEED	full CCW

Refer to Section 5.2 for detailed information on the potentiometers.

PROGRAMMING JUMPER PRESETS

Jumpers J1, J4, J6, J10 and J11 should be placed in the positions appropriate to the line, motor and feedback device rating. J5 should be placed initially in the AFB position until proper encoder or tachometer operation is verified.

Jumpers J2, J3, J7, J8, J9 and J12 will be placed according to the specific application requirements.

Refer to Section 5.1 for detailed information on the programming jumpers.

6.2 Initial Pretest & Power-Up

PRETEST

The Elite® control has two separate powered circuits, the three phase input to the semiconductor fuses and the single phase 115 VAC from the control voltage transformer. With the control transformer connected as detailed in Section 4.1, only a three phase power feed to the control is required.

Power should not be applied to the control until proper input voltage level and connections are verified. Input voltage should be checked ahead of the supplying circuit breaker, disconnect switch, etc. before it is switched on.

Connections should be visually inspected and checked for tightness. An ohmmeter can be used to check for ground faults. Even though the Elite® control circuit is isolated and can be grounded, it is not necessary and is generally undesirable because other circuits connected to it may not be isolated and because of the possibility of ground loops, noise conditions caused by shields being connected at more than one place. Ground faults in un-isolated circuits for the armature and field can cause fuse blowing and damage to the motor and control.

To check for grounds with an ohmmeter, select a high resistance scale such as R x 100K ohms or greater. Test from each connection terminal (including shields) to chassis ground and be suspicious of any resistance reading less than 500K ohms.

NOTE: An exception to this test would be made where the A.C. line supply is connected to a grounded "Y" type transformer secondary.

Power-up

STEP 1

Apply A.C. power to the control. **Do not run or jog at this time.** The ZERO SPEED LED should be on. The FAULT relay should be energized. Refer to Section 7.1.

STEP 2

Verify 115 VAC at TB3-1 & 2 and proper field voltage at TB3-4 & 5, 150VDC for 230VAC inputs, 230VDC for 380VAC inputs and 300VDC for 460VAC inputs.

NOTE: Rated field voltage is present after power-up only for the time period set by the DELAY TIME pot on the fuse board. Refer to Section 7.6 for more information.

A Carotron DCM100-000 Drive Circuit Monitor can be used at this time to measure the power supply outputs, CHECKPOINTS A through G. Refer to Table 5 for a list of monitoring points.

6.3 Motor Start-Up

During the following steps the motor will be rotated. If excessive speed or wrong direction of rotation could damage the load, it may be wise to de-couple the load until proper control is verified. Output can be monitored with a voltmeter by measuring SCALED ARMATURE VOLTAGE at testpoint 15 (TP15), by using a DCM100-000 at Checkpoint K – see Section 5.3, by reading the scaled VELOCITY FEEDBACK at TB2B-17 or by measuring armature voltage.

STEP 3

Turn the external Speed pot to zero or full CCW. Note the direction selected on regen models and press the RUN pushbutton. The RUN LED should light.

Increase the Speed pot setting to 20% and observe acceleration to set speed. The Zero Speed LED should turn off at approximately 5% output. Observe the direction of rotation and if wrong correct by removing control power and reversing the motor armature or field leads. If used, observe proper polarization of the series field winding per the instructions in Section 4.2.

Proper tachometer or encoder operation can be checked while running in AFB mode and comparing the TOTAL REFERENCE SETPOINT or ENCODER VOLTAGE signal to the SCALED ARMATURE VOLTAGE signal using the testpoints or the DCM100-000 CHECKPOINTS. If the alternate feedback signal level is close to the AFB level, it can be safely used for feedback.

STEP 4

Ramp Stop and Emergency Stop functions should be tested initially from a low operating speed. Refer to Section 4.3 for descriptions of these stopping methods and proper cycling of the armature contactor.

STEP 5

Increase the Speed reference to maximum. Use the FWD or REV MAX pot(s) to adjust for rated armature voltage, 240, 415, or 500 VDC, or desired motor maximum speed.

STEP 6

Test the JOG function and set desired JOG speed. Select J12 for desired contactor operation in the JOG mode. See Section 5.1 for a description of J12.

6.4 Calibration & Fine Tuning

Refer to the description of adjustment potentiometers in Section 5.2. Most of the Elite® adjustments are straightforward and self explanatory. Those discussed here have more complex functions or adjustment procedures.

I.R. COMP

As mentioned before, the I.R. COMP is functional only in the AFB mode and is used to keep motor speed from decreasing as load is increased. Adjustment is best done when the motor or machine can be loaded normally. If the motor is normally operated at a particular speed, adjust the I.R. COMP while running at that speed. If the motor operates under load over a wide speed

range, pick a speed near mid-range to make the adjustment. Adjust as follows:

Operate the unloaded motor at the normal or mid-range speed and note the exact speed. While still monitoring speed, apply normal load. The reduction in speed of a fully loaded motor will usually fall between 2% and 13% of rated or "base" speed. Slowly increase the I.R. COMP adjustment clockwise until the loaded speed equals the unloaded speed measured in the previous step. Making this adjustment may now cause the unloaded speed to be slightly higher. Repeat this procedure until there is no difference between loaded and unloaded speed levels.

Use care not to set the adjustment too high or speed increase with load and instability may result.

NOTE: For this adjustment, do not use SCALED ARMATURE VOLTAGE to measure speed. Armature voltage is not an exact indication of loaded motor speed!

INTEGRAL NULL

Adjustment of the INTEGRAL NULL pot is sometimes required when the control is continually operated in the RUN mode with a zero speed reference or when very rapid stopping is required. With maintained zero reference, creeping can occur and depending on dynamics of the load and response of the control, rapid stopping can cause an overshoot through zero speed or back-up in motor rotation at stop. If either of these conditions is apparent, increase the INTEGRAL NULL in the clockwise direction to minimize the symptoms.

Note: Because there is a small reduction in speed regulation, **DO NOT** make this adjustment unless these symptoms are apparent in normal operation.

Elite Drives manufactured after Fall '95 incorporate an integral null circuit that is locked out above zero speed. This eliminates the reduction in speed regulation above zero speed.

I PROPORTIONAL, I INTEGRAL, VELOCITY PROPORTIONAL AND VELOCITY INTEGRAL

The INTEGRAL and PROPORTIONAL adjustments, P1-P4, as preset by Carotron will provide stable and responsive performance under most load conditions. Therefore, any observed instability should first be evaluated as a possible load induced condition.

Cyclic variation in armature current and in motor speed can indicate mechanical coupling or machine loading conditions. If mechanically induced, the instability repetition rate or frequency can usually be related to a motor or machine rotation rate or loading cycle. In this situation, the instability frequency will change in coincidence with any motor speed change.

Instability in the control output due to incorrect adjustment would usually be present over a range of speed and would not usually change frequency in coincidence with speed. Because the response of the control can sometimes be altered to partially compensate for mechanically induced instability, it is sometimes difficult to determine if the load change is affecting control output stability or if control output is affecting the load stability. De-coupling the load can help make this determination.

When re-adjustment of the control loops is determined, start first with the I (current) loop adjustments.

The factory presets P1-P4 at 33% resistance. The adjustment pots are approximately 20-25 turns and have no mechanical stops. When rotated past the end of their resistance range, a faint clicking noise can be heard. You must keep track of the number of turns to know your setting within the adjustment range. If the clicking cannot be heard, count turns on the screwdriver until more than 30 turns have been made. Then rotate in the opposite direction for 8-10 turns to be set at 1/3 rotation.

I INTEGRAL

The I INTEGRAL controls a 10 to 1 change in the current loop integral time constant. Counterclockwise rotation decreases the time or increases the response rate.

I PROPORTIONAL

The I PROPORTIONAL controls a 2 to 1 change in the current loop proportional gain. Clockwise rotation increases the gain and response.

VELOCITY INTEGRAL

The VELOCITY INTEGRAL is a trimming pot that gives a 20 to 1 change in the velocity loop integral time constant. Clockwise rotation increases the time or decreases the response rate.

VELOCITY PROPORTIONAL

The VELOCITY PROPORTIONAL gives a 4 to 1 change in the velocity loop proportional gain. Clockwise rotation increases the gain.

The VELOCITY INTEGRAL and VELOCITY PROPORTIONAL signals are summed to produce the TORQUE DEMAND signal.

The I INTEGRAL and I PROPORTIONAL signals are summed to produce the VCO input signal.

7 Special Circuit Functions & Operating Modes

7.1 Fault Conditions

The Elite® models have four latching type FAULT conditions which cause a control safety shutdown with form "C" contact output and LED indication of the condition. They are Phase Loss, Field Loss, Heatsink Overtemp and Overcurrent.

The LED indicators are located on the PERSONALITY BOARD and are visible from the front of the control with the front panel opened or closed.

The FAULT contact outputs are at TB1 terminals 11, 12 and 13 and are part of the FAULT relay that supplies 115 VAC to all relay logic and customer wiring connected to TB1. This voltage is supplied from TB1-1 when the FAULT relay is in its normally energized state. When a FAULT condition occurs, the relay deenergizes and the control is disabled as in an EMERGENCY STOP condition. The control cannot be restarted until the FAULT is corrected and the RESET button on the CONTROL BOARD or the external FAULT RESET contact at TB2B terminals 23 and 24 is momentarily closed.

NOTE: The control does not automatically restart when reset from a fault condition.

The various FAULT Conditions operate as follows:

PHASE LOSS

A momentary loss, approximately 2 cycles, of any of the three phase line inputs will cause Phase Loss. This time period provides protection of the control without causing sensitivity to line transients.

FIELD LOSS

Discontinuity of the motor field current due to blown fuses, open wiring, open windings, etc. will cause Field Loss.

HEATSINK OVERTEMP

Power bridge heatsink temperature in excess of the safe operating area of the SCR and diode power components will cause Heatsink Overtemp. This could result from continued operation above control load rating, excessive ambient temperature or problems with enclosure forced ventilation or the heatsink fan.

The Overtemp FAULT cannot be reset until heatsink temperature has been reduced approximately 15°C below the trip point.

OVERCURRENT FAULT

OVERCURRENT FAULT is a timed overload condition controlled by the J4 ARM AMPS and the J7 OVERCURRENT range programming jumpers. Refer to Section 5.1 for further information. The control will temporarily allow motor currents up to 150% of the range selected by J4 refer to Table 3. When CURRENT DEMANDed by the load has exceeded 105% of the range for the J7 time period ahead of the slash, the control will FOLDBACK or clamp the current to a maximum of 112%. Continued current demand for the time period behind the slash will cause the control to initiate an OVERCURRENT FAULT condition.

7.2 FWD/REV Direction Enable Controls

The FWD/REV Direction Enable control inputs at TB2A terminals 1-4 provide internal reference clamping for the normal speed reference applied to TB2B-12. Operating either input will prevent motoring in the direction selected.

Refer to Figure 9 - they are normally jumpered; 1 to 2 for forward direction and 3 to 4 for reverse on regenerative models; or are contact controlled when external lockout of direction is required.

NOTE: The RUN mode motoring function only is disabled, i.e. the E12000 Series models can still provide regenerative braking torque for either direction. JOG mode operation is not affected by these enable controls.

7.3 Current Limit by External Signals

Refer to Figure 9 – the Current Limit Control inputs at TB2A terminals 5-8 allow limiting motor current or torque by an external voltage signal. Terminals 5 and 7 are +7.5 VDC and -7.5 VDC respectively and are normally connected to terminals 6 and 8 respectively. The 7.5 volt levels correspond to 150% current level. Refer to Section 5.1 Programming Jumpers and Table 3 for determining the control current rating.

The inputs at terminals 6 and 8 are trimmed by the POS and NEG CURRENT LIMIT pots on the E12000 Series PERSONALITY BOARD and for custom tension control applications will be connected to an externally generated torque reference signal. The voltage applied terminals 6 or 8 should **never** be allowed to exceed 7.5 VDC.

7.4 Summing Input Signal

The Summing Input at TB2B-14 is trimmed by the SUM TRIM pot on the PERSONALITY BOARD and can be made to add or subtract from the RUN and JOG mode reference signals.

The combination of the summing signal and the speed reference gives a TOTAL REFERENCE SETPOINT which is internally limited to give a maximum armature output voltage no greater than 108% of the control rating.

The function of the SUMMING signal is controlled by J2 and the direction command on regen models. With ADD selected at J2, a positive SUMMING signal will add to a positive (forward) reference. A negative SUMMING signal would subtract.

NOTE: With ADD selected, a negative SUMMING signal greater than the Positive reference would cause a net negative TOTAL REFERENCE SETPOINT and would cause REVERSE rotation on regenerative models even with forward direction selected. The same situation could occur if the SUMMING signal was positive and the SUBTRACT position was selected at J2. This logic applies regardless of the direction command by the FWD/REV selector.

With ADD selected, like polarity signals add; unlike polarities subtract from each other with the greatest signal having control of direction. With SUBTRACT selected, like polarities subtract from each other and unlike polarities add.

Placing J3 in the (NOT) JOG/SUM position prevents the SUMMING signal from being combined with the JOG reference.

The SUM TRIM pot can provide a minimum speed function by connecting TB2A-9 to TB2B-14 and placing J2 in the ADD position.

Refer to Section 5.1 for descriptions of the programming jumpers.

7.5 Buffered Monitoring Signals

Buffered outputs for monitoring control operation are provided at terminals 16, 17 and 18. These outputs can source up to 10 mA current each and are used by measuring from CIRCUIT COMMON at terminals 13, 15 or 21. Refer to Figure 11, Section 4.4 - TB2B Terminals 16, 17 and 18 and Table 5 for a description of these terminals and the signals they provide.

7.6 Field Economy & External Field Supplies

FIELD ECONOMY

All Elite® models feature a FIELD ECONOMY circuit to automatically reduce the field supply voltage 35% after being stopped for a time period adjustable by the customer. This time is controlled by a single turn knob adjust DELAY TIME pot located on the FUSE BOARD. The pot ranges from 1 to 3 minutes with counter-clockwise rotation increasing time. The FIELD ECONOMY function is not operational with an externally connected field supply.

EXTERNAL FIELD SUPPLIES

The external field supply connection is used to interface an optional FIELD CURRENT REGULATOR for constant horsepower load applications and when a non-standard field voltage requirement exists.

Refer to Section 4.2 Motor Connections - Field and Figure 6. The FIELD LOSS FAULT function will still operate when J11, located on the FUSE BOARD, is used to interface the field current sensing circuit with the external field supply.

WARNING!!! When interfacing with an external field supply, programming jumper J11 must be placed in the EXT position to prevent damage to the Elite® control or external supply.

8 Spare Parts

8.1 Printed Circuit Assemblies

CONTROL BOARD
All E12000 and E06000 Series models ..... part number D11111-000

PERSONALITY BOARD
All E12000 Series models ..... part number C11114-000
All E06000 Series models ..... part number C11135-000

RELAY BOARD
All E12000 and E06000 Series models ..... part number D11117-000

POWER SUPPLY BOARD
All E12000 and E06000 Series models ..... part number C11120-000

TRIGGER BOARD
All E12000 Series models ..... part number D11123-001
All E06000 Series models ..... part number D11123-000

C.T. (CURRENT TRANSFORMER) BOARD
Models E12200-000 and E06200-000 ..... part number C11126-007
Models E12250-000 and E06250-000 ..... part number C11126-008
Models E12300-000 and E06300-000 ..... part number C11126-009

FUSE BOARD
All E12000 and E06000 Series models ..... part number D11129-001

8.2 Connector/ Cable Assemblies

SAME FOR ALL MODELS
Cable 1 Assembly ..... part number A11178-000
Cable 2 Assembly ..... part number CNT1065-00
Cable 3 Assembly ..... part number A11179-000
Cable 4 Assembly ..... part number CNT1066-00
Cable 5 Assembly ..... part number CNT1066-00
Cable 6 Assembly ..... part number CNT1067-00
Cable 7 Assembly ..... part number CNT1065-00

E06 MODELS
Cable 8 Assembly ..... part number A11523
Cable 9 Assembly ..... part number A11525
Cable 10 Assembly ..... part number A11527
Cable 11 Assembly ..... part number A11529

E12 MODELS
Cable 8 Assembly ..... part number A11524
Cable 9 Assembly ..... part number A11526
Cable 10 Assembly ..... part number A11528
Cable 11 Assembly ..... part number A11530

MODEL DEPENDENT
L1, L2, L3 pressure terminal connectors per model

Models E12200-000 & E12250-000
Models E06200-000 & E06250-000
Carotron CNT1012-08
T&B L40-38
Blackburn CTL40-38

Models E12300-000 & E06300-000
Carotron CNT1012-24
T&B 5411506

8.3 Fuses

SAME FOR ALL MODELS

FU1, FU2, FU3: 10 ampere, dual element, time delay, 500 VAC located on the FUSE BOARD
Carotron FUS1008-03
Bussmann FNQ-10
Littelfuse FLQ-10

FU4: 5 ampere, 250 VAC, dual element, time delay located on the FUSE BOARD
Carotron FUS1005-01
Bussmann MDA-5
Littelfuse 326005

FU8: 0.5 ampere, 120 VAC, dual element, time delay- located on the Power Supply Board
Carotron FUS1006-05
Bussmann MDL-1/2
Littelfuse 313.500

MODEL DEPENDENT

FU5, FU6, FU7 Current rating per model, 500 VAC semiconductor types

Models E12200-000 & E06200-000: 450 ampere
Carotron FUS1009-07
Bussmann FWH450
Littelfuse L50S450

Models E12250-000 & E06250-000: 600 ampere
Carotron FUS1009-08
Bussmann FWH600
Littelfuse L50S600

Models E12300-000 & E06300-000: 700 ampere
Carotron FUS1009-09
Bussmann FWH700
Littelfuse L50S700

8.4 Power Components

ARMATURE BRIDGE

All armature bridge devices are dual SCR isolated power modules rated at 1400 volts repetitive peak off state and reverse voltage and have 1000 V/uS dvdt. There are 3 each on E06000 Series models, PMD1-3, and 3 additional, PMD4-6, on E12000 Series models. Current ratings are per control model.

Models E12200-000 & E06200-000: 210 ampere
Carotron PMD1030-00
AEG/Eupec TT210N14KOF
Semikron SKKT210/14E
Powerex ED431421

Models E12250-000 & E12300-000
Models E06250-000 & E06300-000: 251 ampere
Carotron PMD1031-00
AEG/Eupec TT251N14KOF
Semikron SKKT250/14E

FIELD SUPPLY

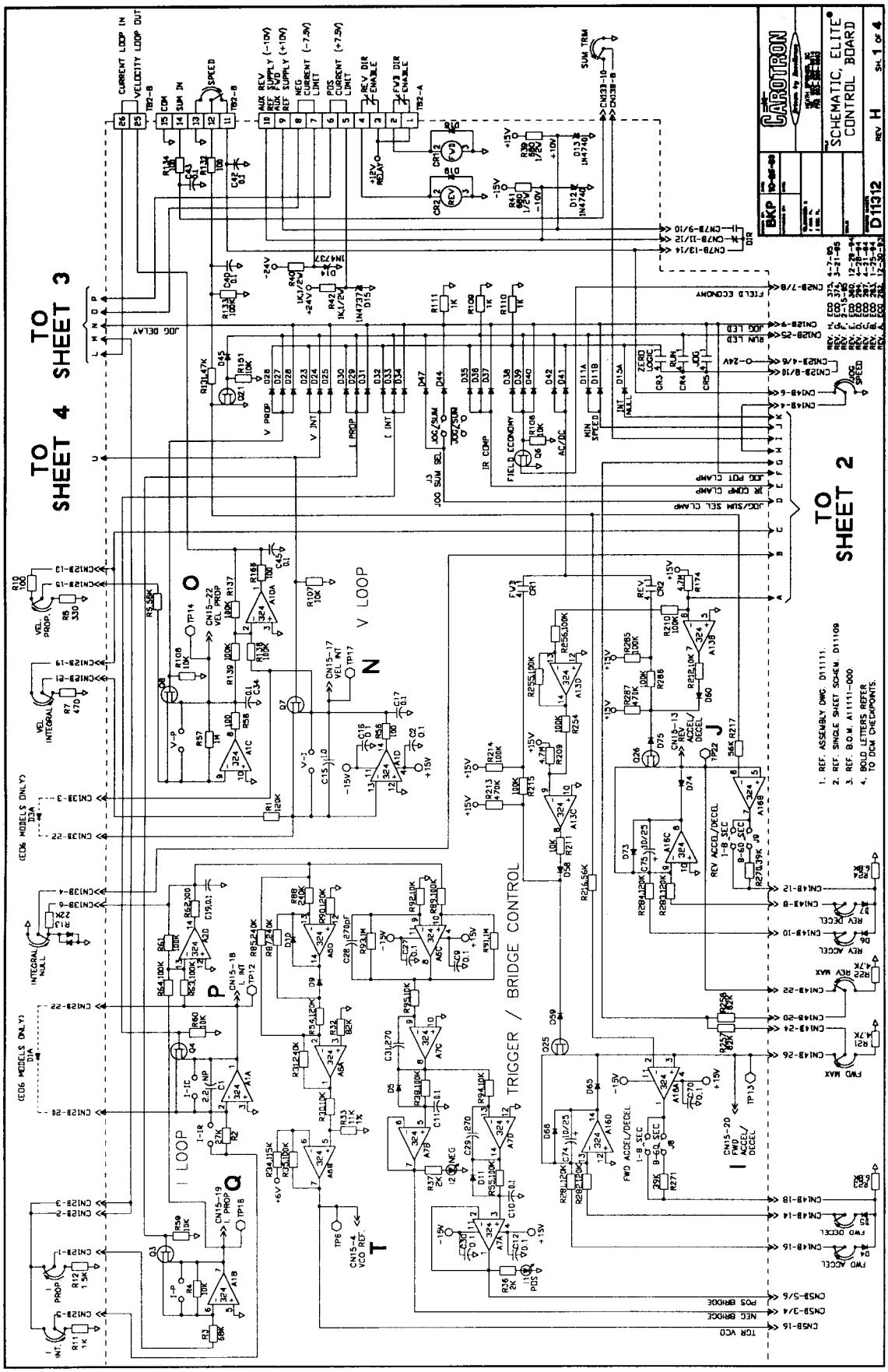
The field supply uses the same power components for all models.

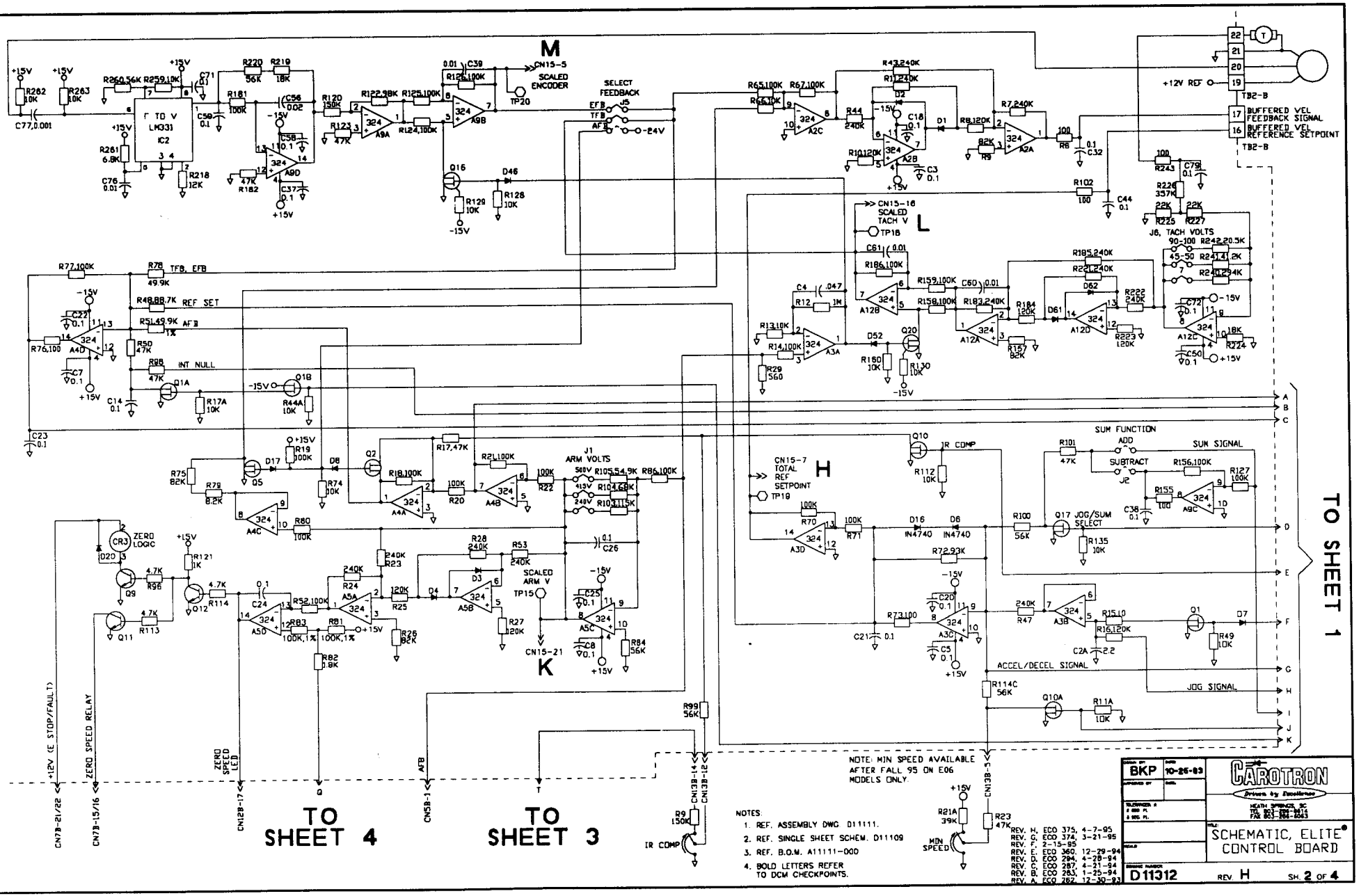
PMD9, dual diode, 22 ampere, 1400 volts
Carotron PMD1024-00
AEG/Eupec DD22S1400K-K

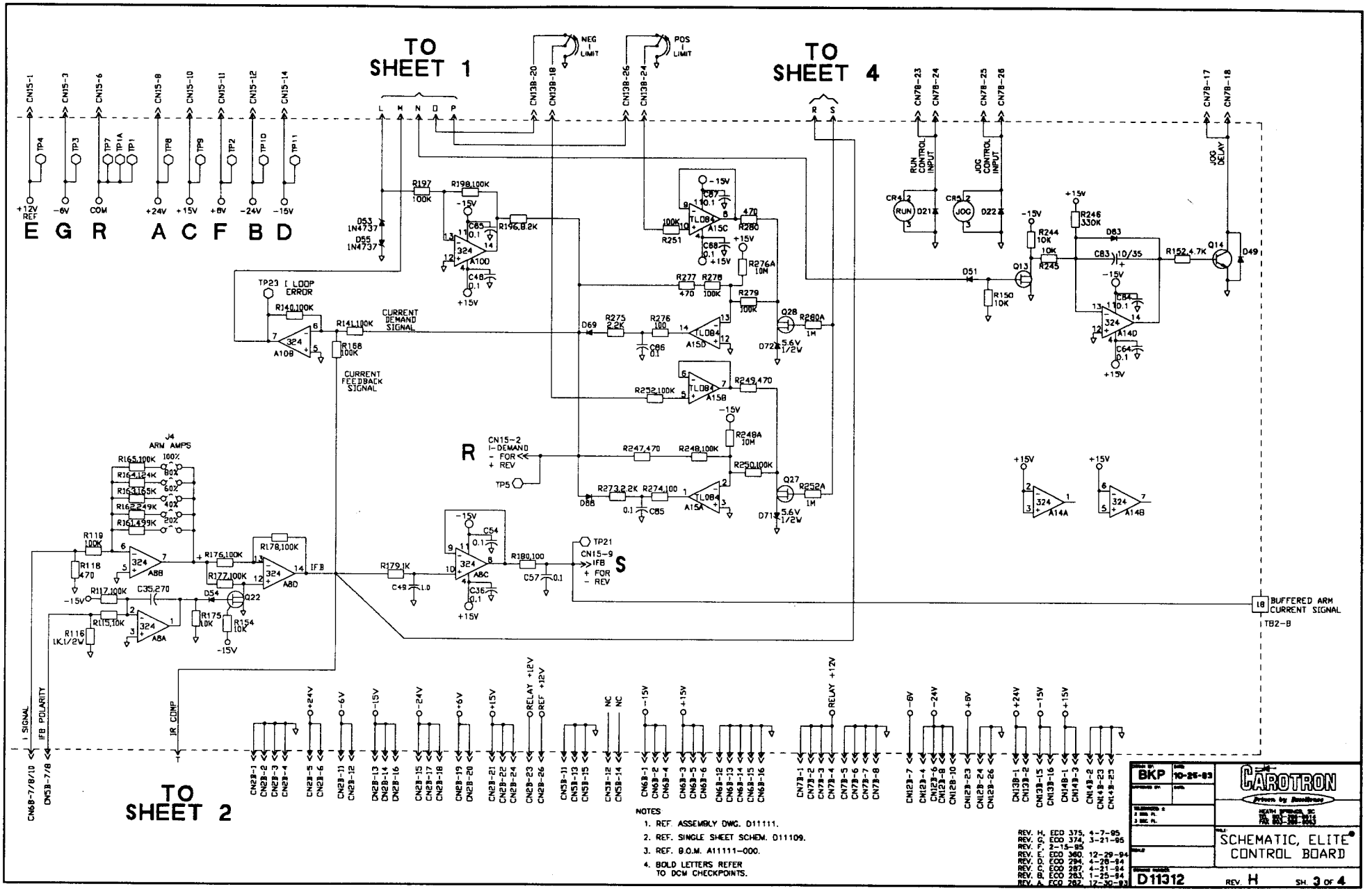
PMD10, SCR/diode, 25 ampere, 1400 volts
Carotron PMD1010-02
AEG/Eupec TD25N14KOF
Semikron SKKH25/14E

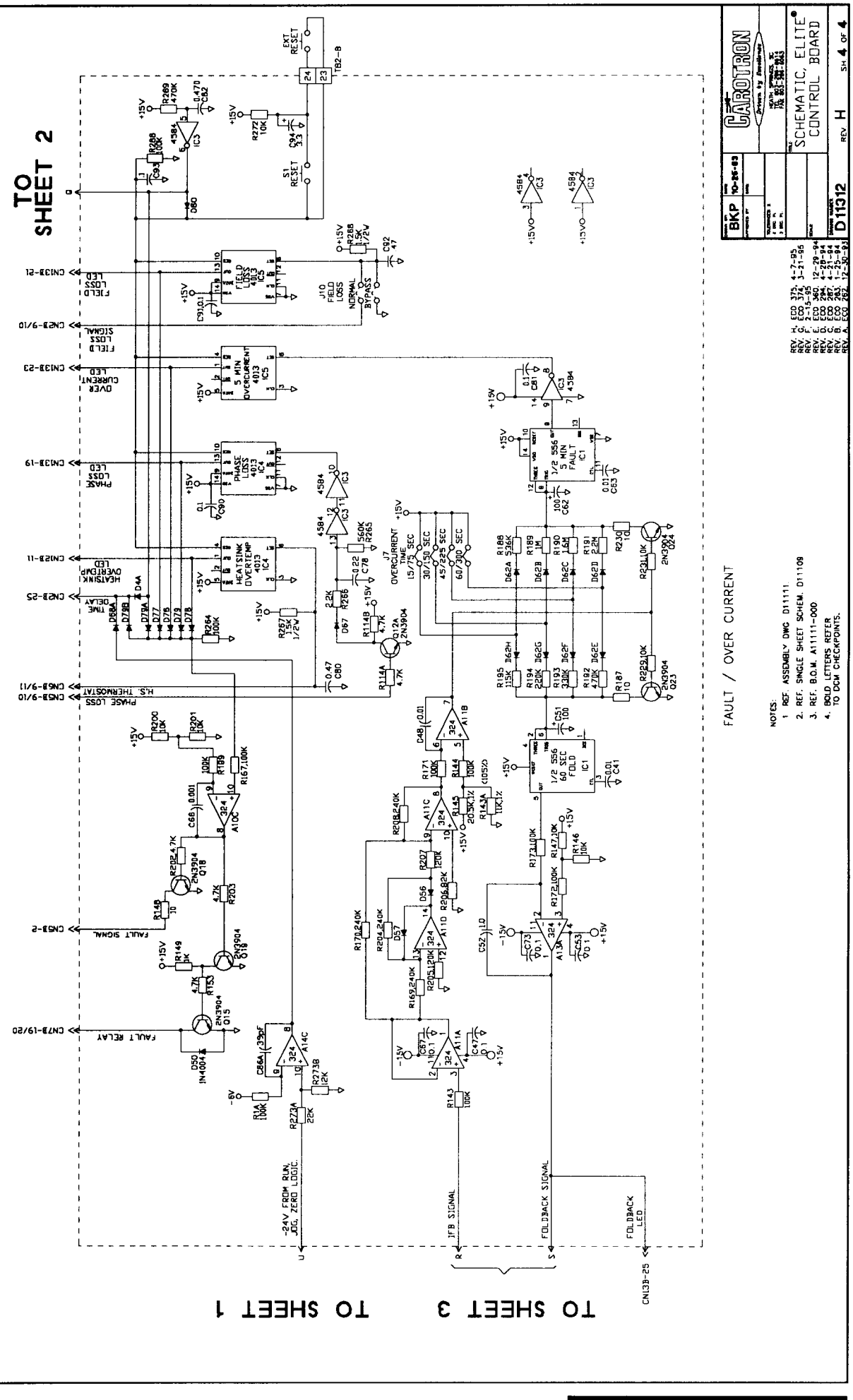
PMD7 and PMD8, diode doubler, 25 ampere, 50 volts
Carotron PMD1009-00
EDI FPID2505

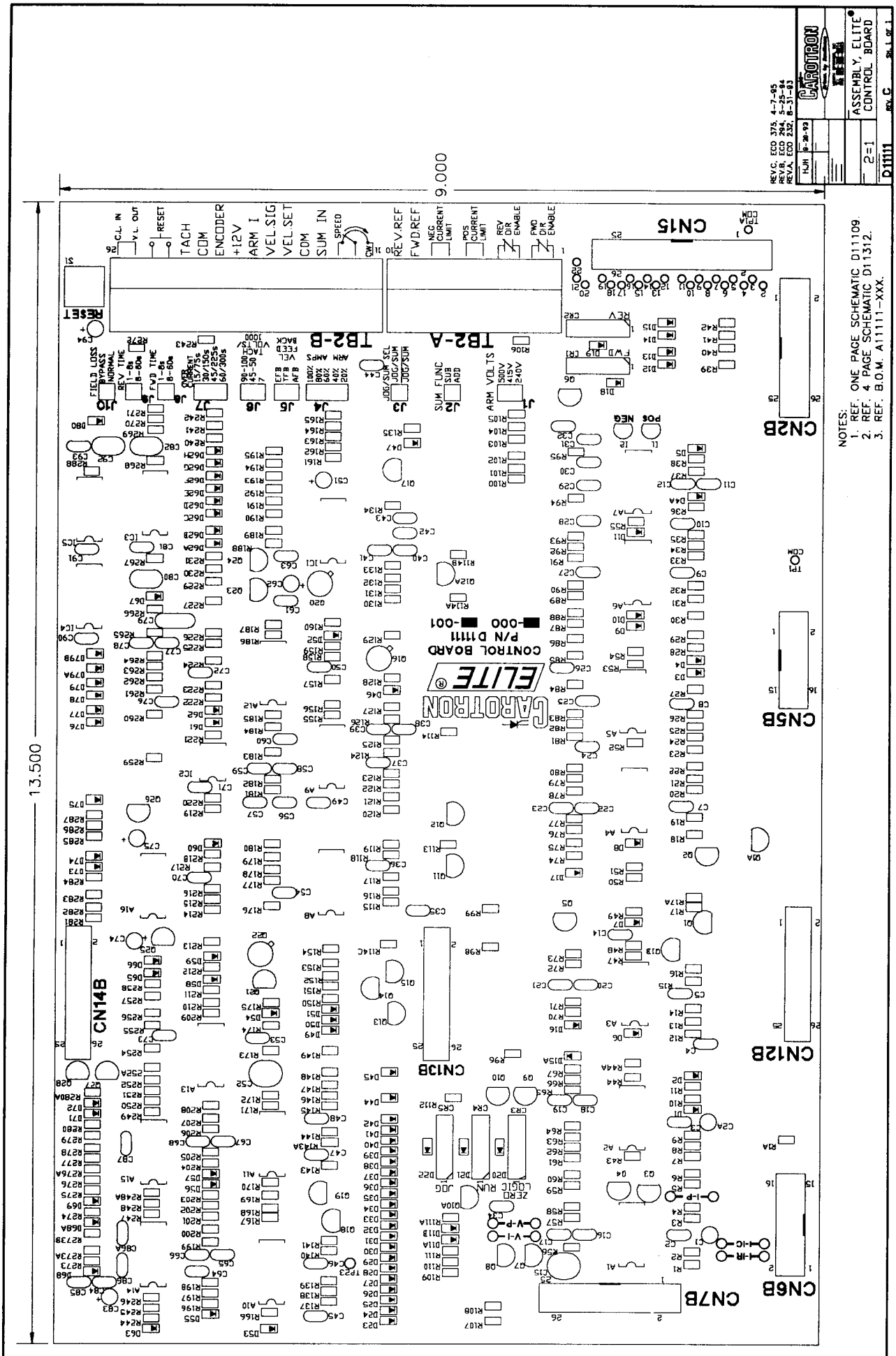
9 Prints

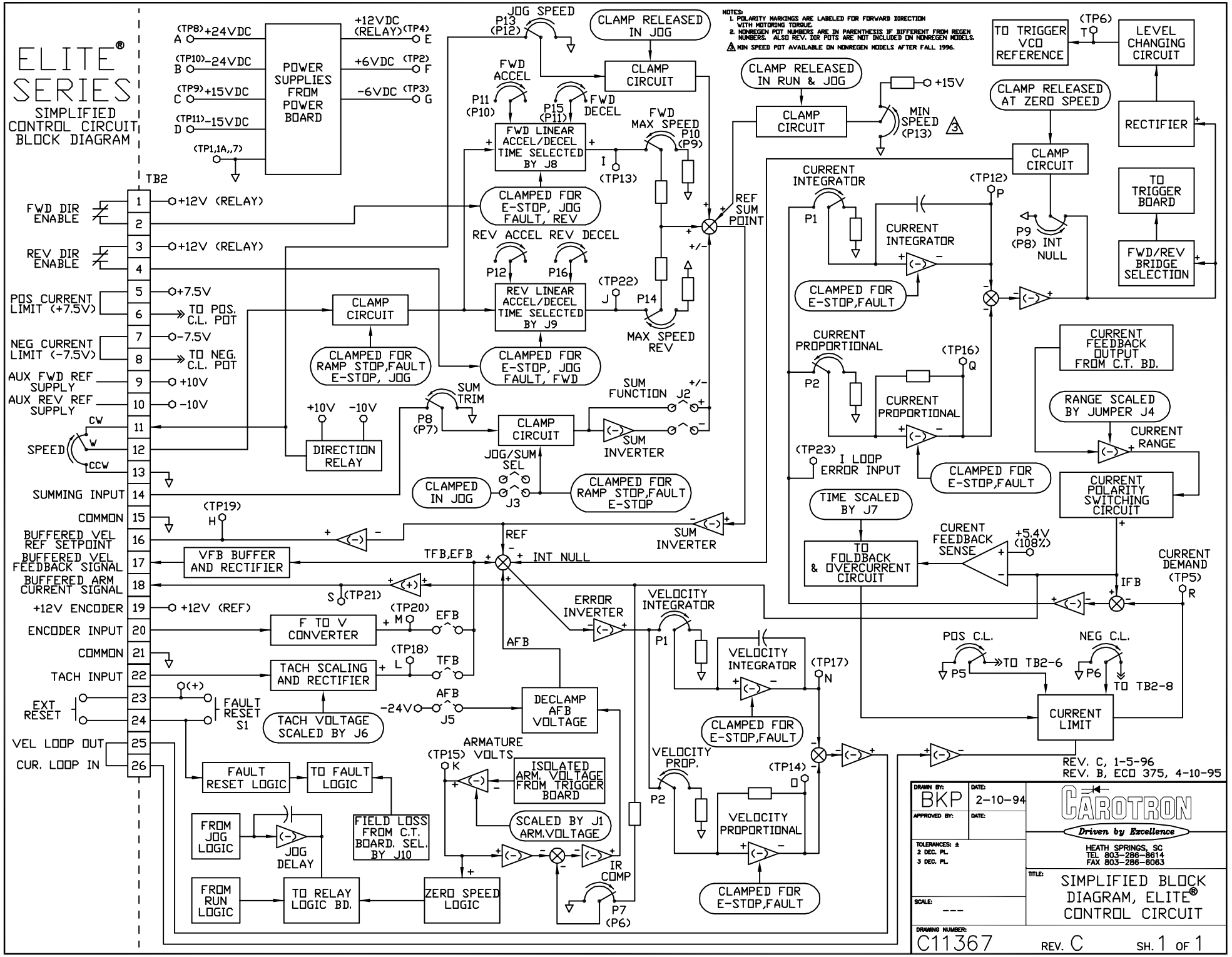

SCHEMATIC, ELITE®
CONTROL BOARD
CAROTRON
D11312
REV H
SH. 1 OF 4
TO SHEET 4
TO SHEET 3
TO SHEET 2
V LOOP
I LOOP
TRIGGER / BRIDGE CONTROL
1. REF. ASSEMBLY DWG. D11111.
2. REF. SINGLE SHEET SCHEM. D11109
3. REF. B.O.M. A11111-000
4. BOLD LETTERS REFER TO DCM CHECKPOINTS.

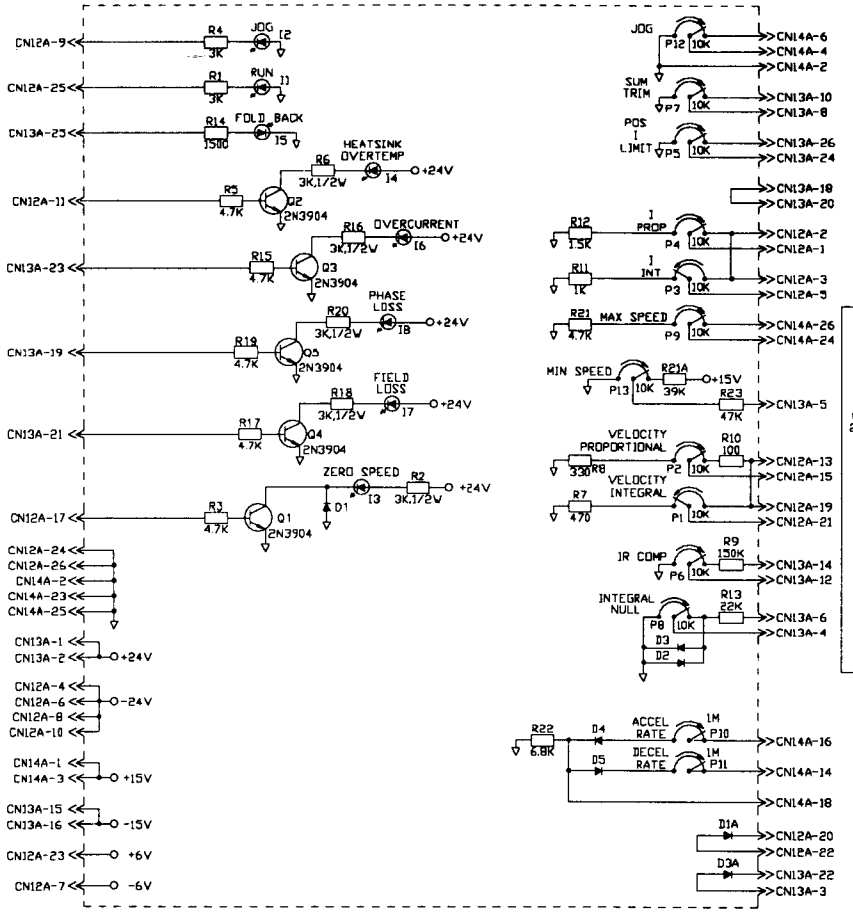

M
L
H
K
TO SHEET 1
TO SHEET 4
TO SHEET 3
SELECT FEEDBACK
EFB
TFB
AFB
+24V
SCALED ENCODER
CN15-5
TP20
+12V REF
TB2-B
BUFFERED VEL FEEDBACK SIGNAL
BUFFERED VEL REFERENCE SETPOINT
CN15-16 SCALED TACH V
TP16
J6, TACH VOLTS
90-100
45-50
TFB, EFB
REF SET
AFB
INT NULL
J1 ARM VOLTS
CN15-7 TOTAL REF SETPOINT
TP19
SUM FUNCTION
ADD
SUBTRACT
SUM SIGNAL
IR COMP
Q17 JOG/SUM SELECT
ZERO LOGIC
SCALED ARM V
TP15
CN15-21
ACCEL/DECEL SIGNAL
JOG SIGNAL
MIN SPEED
+12V (E STOP/FAULT)
ZERO SPEED RELAY
ZERO SPEED LED
CN78-21/22
CN78-15/16
CN128-17
CN58-1
CN13B-14
CN13B-12
CN13B-13
NOTE: MIN SPEED AVAILABLE AFTER FALL 95 ON E06 MODELS ONLY.
NOTES:
1. REF. ASSEMBLY DWG D11111.
2. REF. SINGLE SHEET SCHEM. D11109
3. REF. B.O.M. A11111-000
4. BOLD LETTERS REFER TO DCM CHECKPOINTS.
REV. H, ECO 375, 4-7-95
REV. G, ECO 374, 3-21-95
REV. F, 2-15-95
REV. E, ECO 360, 12-29-94
REV. D, ECO 294, 4-28-94
REV. C, ECO 287, 4-21-94
REV. B, ECO 283, 1-25-94
REV. A, ECO 262, 12-30-93
BKP
10-26-93
CAROTRON
Drives by Excellence
SCHEMATIC, ELITE® CONTROL BOARD
D11312
REV. H
SH. 2 OF 4


TO SHEET 1
TO SHEET 4
TO SHEET 2
CN15-1
CN15-3
CN15-6
CN15-8
CN15-10
CN15-11
CN15-12
CN15-14
+12V REF
-6V
COM
+24V
+15V
+8V
-24V
-15V
E G R A C F B D
TP4
TP3
TP7
TP1A
TP1
TP8
TP9
TP2
TP10
TP11
L M N O P
CN13B-20
CN13B-18
CN13B-26
CN13B-24
NEG I LIMIT
POS I LIMIT
R197 100K
R198,100K
R196,8.2K
D53 1N4737
D55 1N4737
C85 10.1
C48 0.1
TP23 I LOOP ERROR
R140,100K
R141,100K
R168 100K
CURRENT DEMAND SIGNAL
CURRENT FEEDBACK SIGNAL
A10B
A15C
A15D
A15B
A15A
A14A
A14B
A14C
A14D
R251 100K
C87 10.1
C88 0.1
R280 470
R276A 10M
R277 470
R278 100K
R279 100K
R275 2.2K
R276 100
C86 0.1
D69
Q28
R280A 1M
D72 5.6V 1/2W
R232,100K
R249,470
R248A 10M
R247,470
R248,100K
R250,100K
R273,2.2K
R274,100
C85 0.1
D68
Q27
R252A 1M
D71 5.6V 1/2W
R
CN15-2 I-DEMAND - FOR + REV
TP5
J4 ARM AMPS
R165,100K 100%
R164,124K 80%
R163,165K 60%
R162,249K 40%
R161,499K 20%
R119 100K
R118 470
R176,100K
R178,100K
R177,100K
R117,100K
C35,270
D54
Q22
R115,10K
R116 1K,1/2W
R175 10K
R154 10K
A8B
A8D
A8C
A8A
IFB
R179,1K
C49 1.0
C54 0.1
C36 0.1
R180,100
C57 0.1
TP21
CN15-9 IFB + FOR - REV
S
RUN CONTROL INPUT
JOG CONTROL INPUT
CR12 RUN
CR12 JOG
D21
D22
CN78-23
CN78-24
CN78-25
CN78-26
CN78-17
CN78-18
JOG DELAY
R246 330K
R244 10K
R245 10K
R150 10K
D51
Q13
D63
C83 10/35
R152,4.7K
Q14
D49
C84 0.1
C64 0.1
18 BUFFERED ARM CURRENT SIGNAL
TB2-B
I SIGNAL
IFB POLARITY
IR COMP
CN68-7/8/10
CN58-7/8
CN28-1 CN28-2 CN28-3 CN28-4
CN28-5 CN28-6
CN28-11 CN28-12
CN28-13 CN28-14 CN28-16
CN28-15 CN28-17 CN28-18
CN28-19 CN28-20
CN28-21 CN28-22 CN28-24
CN28-23 CN28-26
CN58-11 CN58-13 CN58-15
CN58-12 CN58-14
CN68-1 CN68-2 CN68-4
CN68-3 CN68-5 CN68-6
CN68-12 CN68-13 CN68-14 CN68-15 CN68-16
CN78-1 CN78-2 CN78-3 CN78-4 CN78-5 CN78-6 CN78-7 CN78-8
CN123-7 CN123-4 CN123-6 CN123-8 CN128-10
CN128-23 CN128-24 CN128-26
CN138-1 CN138-2 CN138-15 CN138-16
CN148-1 CN148-3 CN148-23 CN148-25
CN148-2 CN148-24
O+24V
O-6V
O-15V
O-24V
O+6V
O+15V
ORELAY +12V
OREF +12V
NC
RELAY +12V
NOTES
1. REF. ASSEMBLY DWG. D11111.
2. REF. SINGLE SHEET SCHEM. D11109.
3. REF. B.O.M. A11111-000.
4. BOLD LETTERS REFER TO DCM CHECKPOINTS.
REV. H ECO 375, 4-7-95
REV. G ECO 374, 3-21-95
REV. F 2-15-95
REV. E ECO 360, 12-29-94
REV. D ECO 294, 4-28-94
REV. C ECO 287, 4-21-94
REV. B ECO 283, 1-25-94
REV. A ECO 267, 12-30-93
BKP
10-26-93
CAROTRON
Driven by Excellence
SCHEMATIC, ELITE CONTROL BOARD
D11312
REV. H
SH. 3 OF 4


TO SHEET 2
TO SHEET 3
TO SHEET 1
FAULT / OVER CURRENT
SCHEMATIC, ELITE
CONTROL BOARD
CAROTRON
D11312
REV H
SH 4 OF 4
BKP
10-26-93
NOTES:
1. REF. ASSEMBLY DWG D11111.
2. REF. SINGLE SHEET SCHEM. D11109
3. REF. B.O.M. A11111-000
4. BOLD LETTERS REFER TO DCM CHECKPOINTS.
REV. H ECO 375 4-7-95
REV. G ECO 374 3-21-95
REV. F ECO 295 2-13-95
REV. E ECO 294 12-29-94
REV. D ECO 287 4-28-94
REV. C ECO 283 4-21-94
REV. B ECO 282 4-13-94
REV. A ECO 276 12-30-93
FIELD LOSS LED
FIELD LOSS SIGNAL
OVER CURRENT LED
PHASE LOSS LED
HEATSINK OVERTEMP LED
TIME DELAY
PHASE LOSS
H.S. THERMOSTAT
FAULT SIGNAL
FAULT RELAY
-24V FROM RUN, JOG, ZERO LOGIC.
IFB SIGNAL
FOLDBACK SIGNAL
FOLDBACK LED
CN13B-25
FIELD LOSS 4013 IC2
5 MIN OVERCURRENT 4013 IC5
PHASE LOSS 4013 IC3
HEATSINK OVERTEMP 4013 IC4
1/2 556 5 MIN FAULT IC1
1/2 556 60 SEC FOLD IC1
OVERCURRENT TIME 15/75 SEC 30/150 SEC 45/225 SEC 60/300 SEC
J10 FIELD LOSS NORMAL BYPASS
EXT RESET
S1 RESET
TB2-B
4584 IC3
324 A11A A11B A11C A11D A13A A14C

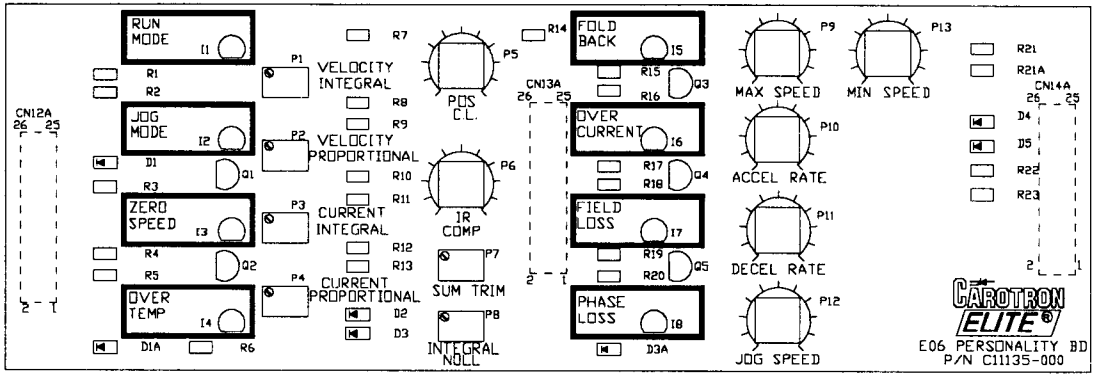

CONTROL BOARD
P/N D11111
-000 -001
ELITE
CAROTRON
TB2-A
TB2-B
CN15
CN2B
CN5B
CN12B
CN6B
CN7B
CN13B
CN14B
9.000
13.500
ASSEMBLY, ELITE
CONTROL BOARD
D11111
REV. C
2=1
NOTES:
1. REF. ONE PAGE SCHEMATIC D11109.
2. REF. 4 PAGE SCHEMATIC D11312.
3. REF. B.O.M. A11111-XXX.


ELITE® SERIES
SIMPLIFIED CONTROL CIRCUIT BLOCK DIAGRAM
NOTES:
1. POLARITY MARKINGS ARE LABELED FOR FORWARD DIRECTION WITH MOTORING TORQUE.
2. NONREGEN POT NUMBERS ARE IN PARENTHESIS IF DIFFERENT FROM REGEN NUMBERS. ALSO REV. DIR POTS ARE NOT INCLUDED ON NONREGEN MODELS.
3. MIN SPEED POT AVAILABLE ON NONREGEN MODELS AFTER FALL 1996.
(TP8) +24VDC
(TP10) -24VDC
(TP9) +15VDC
(TP11) -15VDC
(TP1,1A,,7)
POWER SUPPLIES FROM POWER BOARD
+12VDC (RELAY) (TP4)
+6VDC (TP2)
-6VDC (TP3)
TB2
FWD DIR ENABLE
REV DIR ENABLE
POS CURRENT LIMIT (+7.5V)
NEG CURRENT LIMIT (-7.5V)
AUX FWD REF SUPPLY
AUX REV REF SUPPLY
SPEED
SUMMING INPUT
COMMON
BUFFERED VEL REF SETPOINT
BUFFERED VEL FEEDBACK SIGNAL
BUFFERED ARM CURRENT SIGNAL
+12V ENCODER
ENCODER INPUT
COMMON
TACH INPUT
EXT RESET
VEL LOOP OUT
CUR. LOOP IN
+12V (RELAY)
+7.5V
TO POS. C.L. POT
-7.5V
TO NEG. C.L. POT
+10V
-10V
CW
CCW
JOG SPEED
P13 (P12)
CLAMP RELEASED IN JOG
CLAMP CIRCUIT
FWD ACCEL
P11 (P10)
P15 (P11)
FWD DECEL
FWD LINEAR ACCEL/DECEL TIME SELECTED BY J8
FWD MAX SPEED P10 (P9)
I (TP13)
CLAMPED FOR E-STOP, JOG FAULT, REV
REV ACCEL
REV DECEL
P12
P16
REV LINEAR ACCEL/DECEL TIME SELECTED BY J9
J (TP22)
P14
MAX SPEED REV
CLAMPED FOR RAMP STOP,FAULT E-STOP, JOG
CLAMPED FOR E-STOP, JOG FAULT, FWD
DIRECTION RELAY
SUM TRIM
P8 (P7)
SUM FUNCTION J2
SUM INVERTER
JOG/SUM SEL
J3
CLAMPED IN JOG
CLAMPED FOR RAMP STOP,FAULT E-STOP
REF SUM POINT
CLAMP RELEASED IN RUN & JOG
+15V
MIN SPEED (P13)
CLAMP RELEASED AT ZERO SPEED
TO TRIGGER VCO REFERENCE
(TP6) T
LEVEL CHANGING CIRCUIT
RECTIFIER
TO TRIGGER BOARD
FWD/REV BRIDGE SELECTION
CURRENT INTEGRATOR
(TP12) P
P1
P9 (P8) INT NULL
CLAMPED FOR E-STOP,FAULT
CURRENT PROPORTIONAL
(TP16) Q
P2
CURRENT FEEDBACK OUTPUT FROM C.T. BD.
RANGE SCALED BY JUMPER J4
CURRENT RANGE
(TP23) I LOOP ERROR INPUT
CLAMPED FOR E-STOP,FAULT
CURRENT POLARITY SWITCHING CIRCUIT
TIME SCALED BY J7
TO FOLDBACK & OVERCURRENT CIRCUIT
CURENT FEEDBACK SENSE
+5.4V (108%)
IFB
CURRENT DEMAND (TP5) R
(TP19) H
REF
SUM INVERTER
VFB BUFFER AND RECTIFIER
TFB,EFB
INT NULL
S (TP21)
ERROR INVERTER
VELOCITY INTEGRATOR
F TO V CONVERTER
(TP20) M
EFB
AFB
TACH SCALING AND RECTIFIER
(TP18) L
TFB
TACH VOLTAGE SCALED BY J6
-24V
AFB J5
DECLAMP AFB VOLTAGE
VELOCITY INTEGRATOR
(TP17) N
CLAMPED FOR E-STOP,FAULT
POS C.L.
P5
TO TB2-6
NEG C.L.
P6
TO TB2-8
CURRENT LIMIT
FAULT RESET S1
FAULT RESET LOGIC
TO FAULT LOGIC
ARMATURE (TP15) VOLTS
K
ISOLATED ARM. VOLTAGE FROM TRIGGER BOARD
SCALED BY J1 ARM.VOLTAGE
FIELD LOSS FROM C.T. BOARD. SEL. BY J10
FROM JOG LOGIC
JOG DELAY
FROM RUN LOGIC
TO RELAY LOGIC BD.
ZERO SPEED LOGIC
IR COMP
P7 (P6)
VELOCITY PROP.
P2
(TP14) O
VELOCITY PROPORTIONAL
CLAMPED FOR E-STOP,FAULT
REV. C, 1-5-96
REV. B, ECO 375, 4-10-95
DRAWN BY: BKP
DATE: 2-10-94
APPROVED BY:
DATE:
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.
SCALE: ---
CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063
TITLE: SIMPLIFIED BLOCK DIAGRAM, ELITE® CONTROL CIRCUIT
DRAWING NUMBER: C11367
REV. C
SH. 1 OF 1



SCHEMATIC C11133

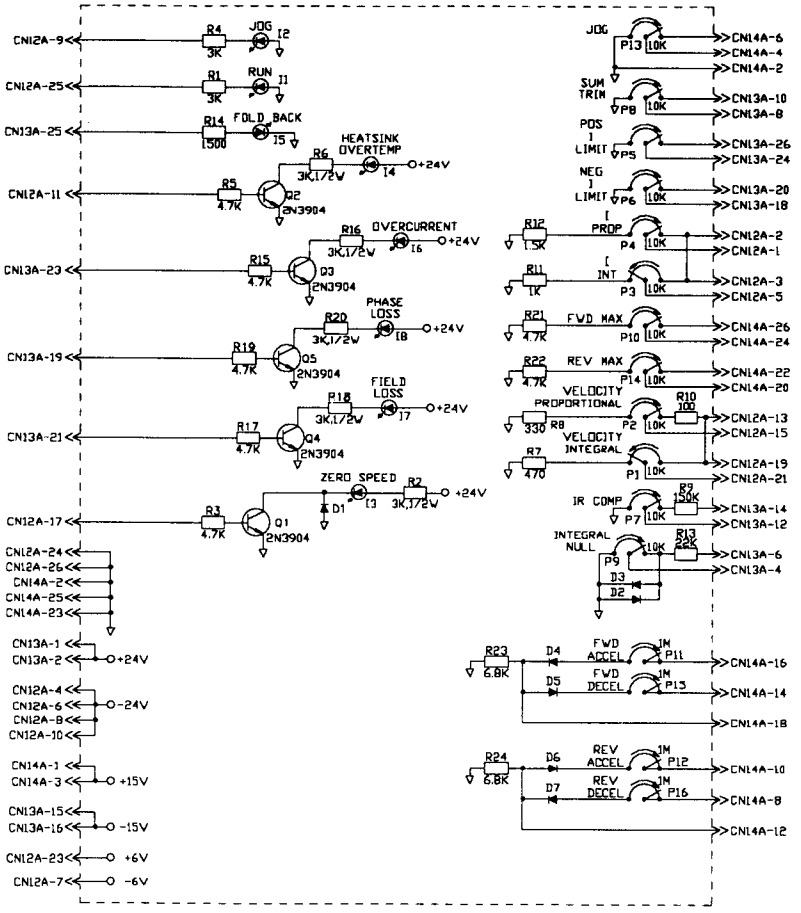
REV.G, ECO 376, 4-7-95
REV.F, ECO 323, 8-21-94
REV.E, ECO 294, 4-28-94
REV.D, ECO 268, 1-13-94
REV.C, ECO 264, 12-30-93
REV.B, ECO 242, 10-4-93
REV.A, ECO 230, 8-17-93



ASSEMBLY C11135

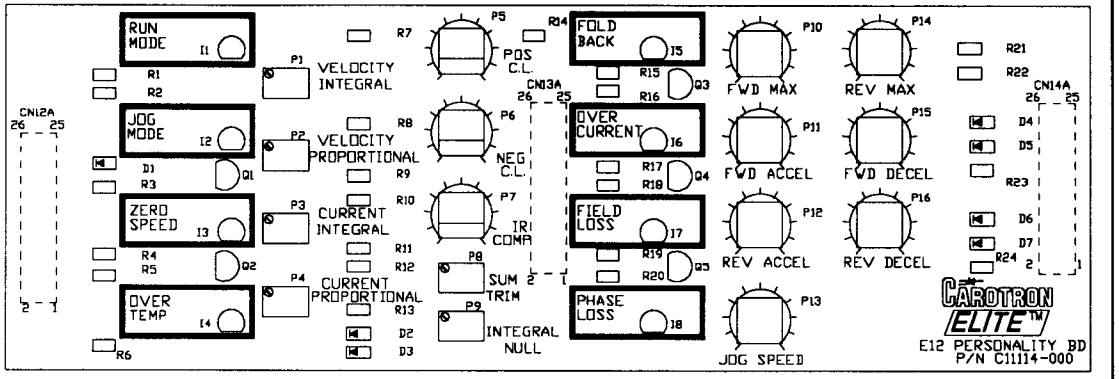
REV.B, ECO 376, 4-7-95
REV.A, ECO 230, 8-17-93

DRAWN BY: BKP	DATE: 12/1/94	CAROTRON driven by excellence	
APPROVED BY:	DATE:	HEATH SPRINGS, SC PH: 803-698-2943 FAX: 803-698-2943	
TOLERANCES: ± DEC PL. = .005 ± DEC PL. = .030		TITLE: SCHEMATIC & ASSEMBLY, ELITE E06000 SERIES PERSONALITY BOARD	
MODEL:		DRAWING NUMBER: D11590	REV. A SH. 1 OF 1



SCHEMATIC C11112

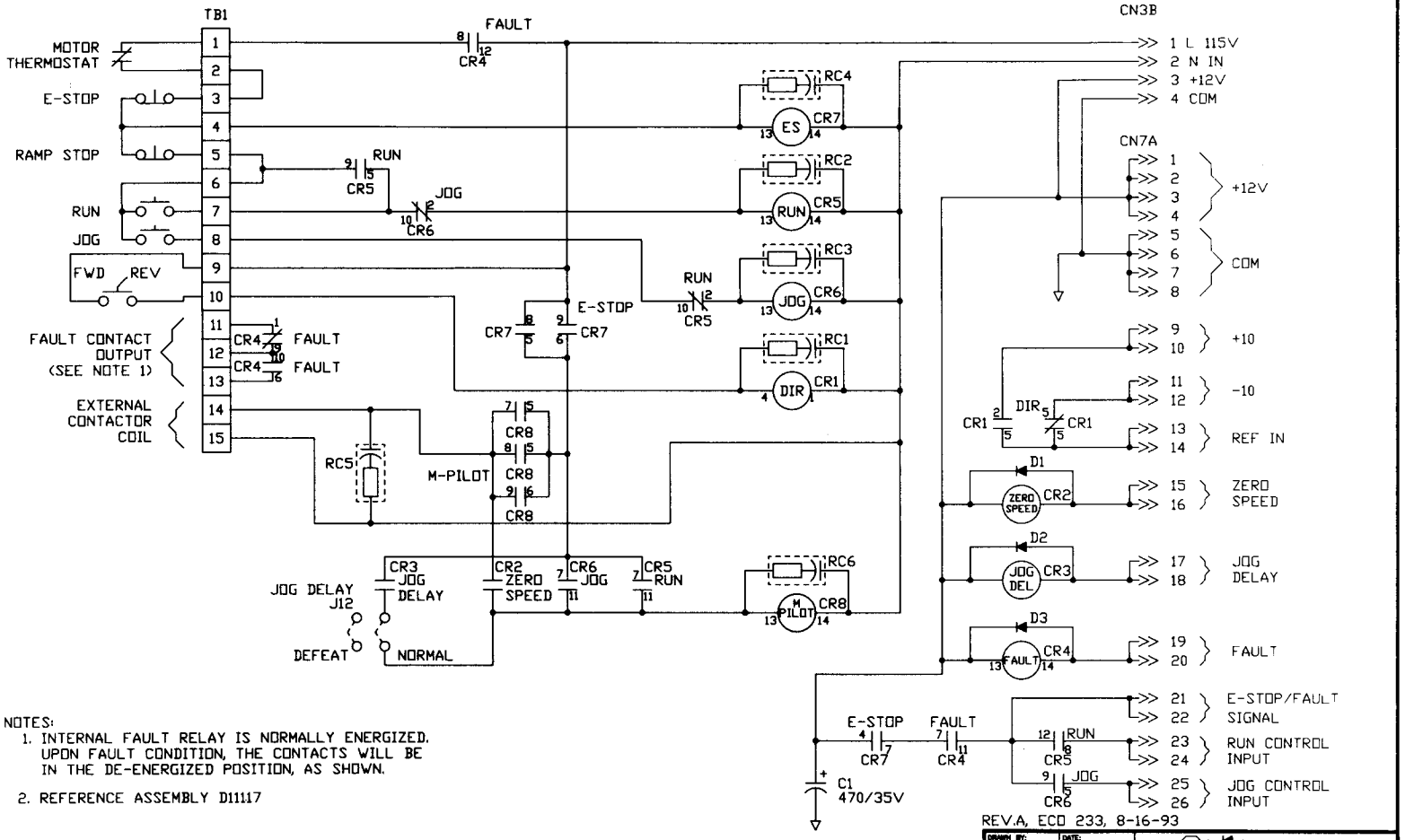
REV.F, ECO 375, 4-10-95
REV.E, ECO 323, 8-22-94
REV.D, ECO 294, 4-28-94
REV.C, ECO 264, 12-30-93
REV.B, ECO 242, 10-4-93
REV.A, ECO 231, 8-16-93



ASSEMBLY C11114

REV.A, ECO 231, 8-16-93

DRAWN BY BKP	DATE 12/1/94	CAROTRON Drives by Excellence
APPROVED BY	DATE	HEATH SPRINGS, SC
TOLERANCES: X ± .XX, X.X ± .XXX, ANGLES ± .5°		TITLE: SCHEMATIC & ASSEMBLY, ELITE E12000 SERIES PERSONALITY BOARD
DRAWING NUMBER D11591	REV. A	SH. 1 OF 1



NOTES:
1. INTERNAL FAULT RELAY IS NORMALLY ENERGIZED. UPON FAULT CONDITION, THE CONTACTS WILL BE IN THE DE-ENERGIZED POSITION, AS SHOWN.
2. REFERENCE ASSEMBLY D11117

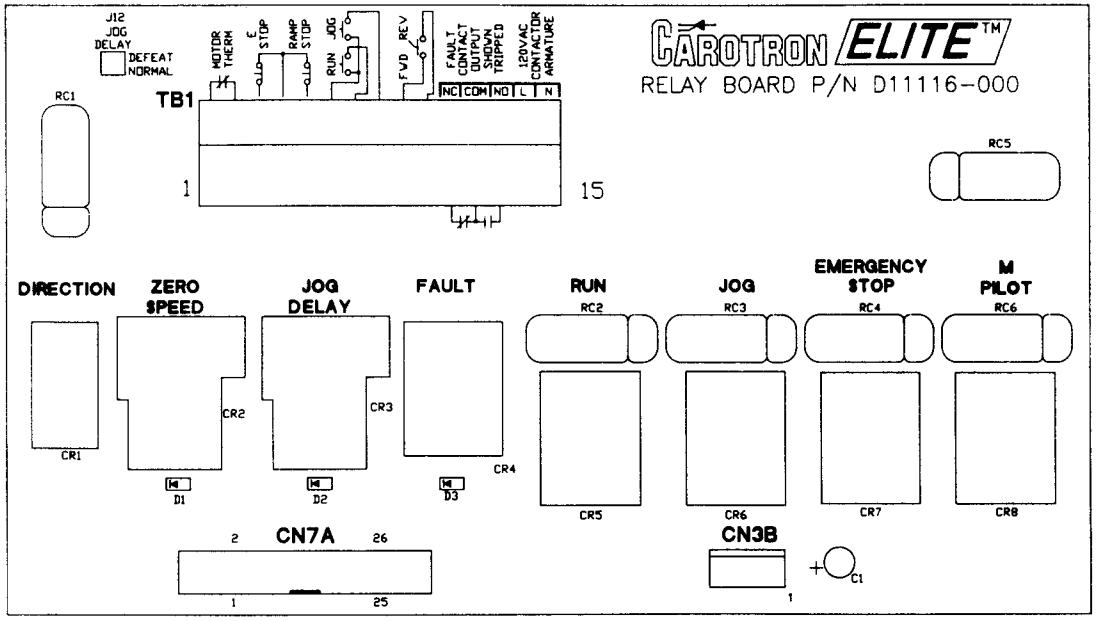
REV.A, ECO 233, 8-16-93

DRAWN BY: UBJ	DATE: 4/6/93
APPROVED BY:	DATE:
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.	
SCALE:	
DRAWING NUMBER: C11115	REV. A

CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063

TITLE: SCHEMATIC, ELITE® RELAY PC BOARD

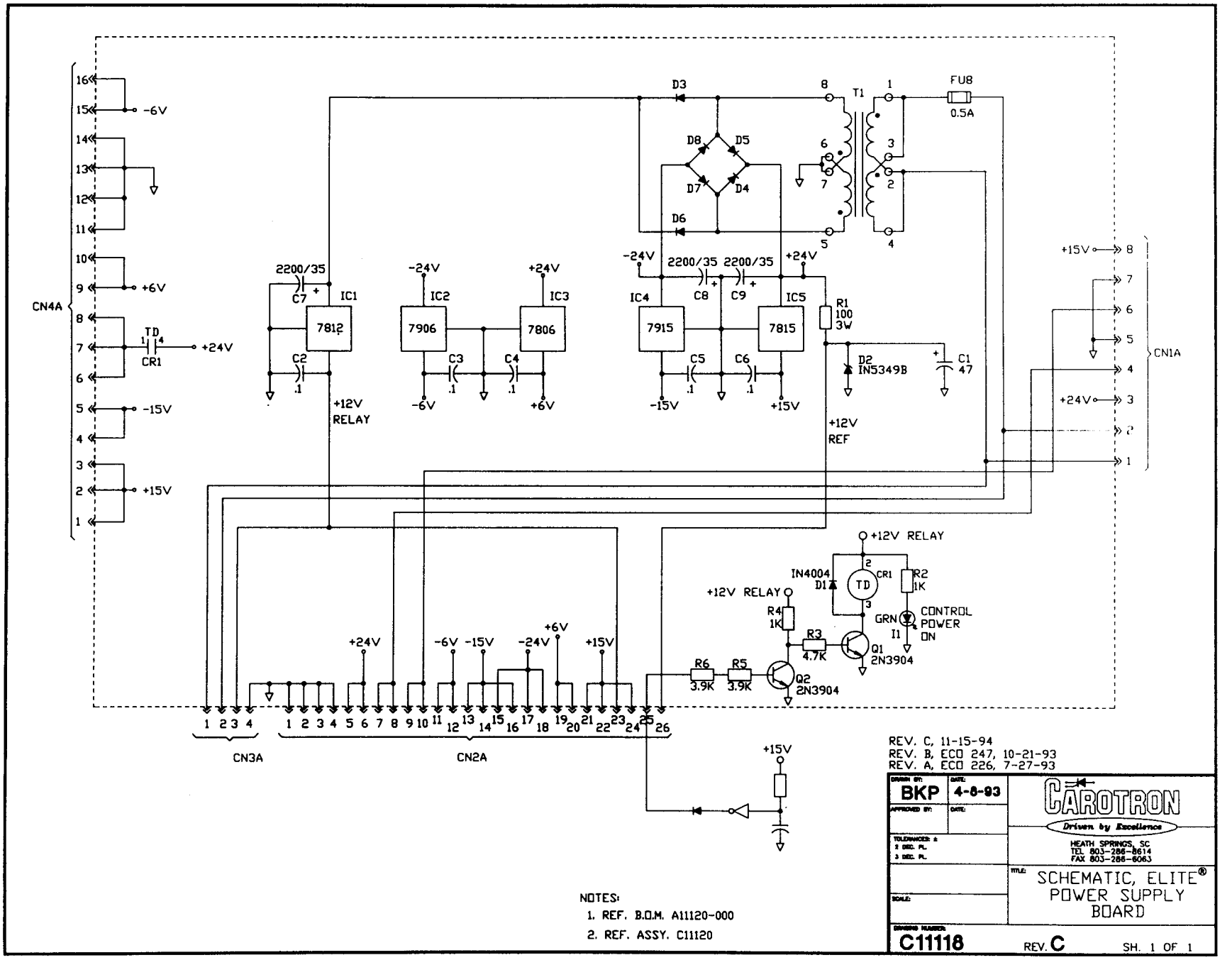
SH. 1 OF 1



NOTES:
1. REF. SCHEMATIC C11115
2. REF. B.O.M. A11117

REV. B, ECO 273, 2-8-94
REV. A, ECO 233, 8-16-93

UBJ	4/7/93	CAROTRON
		ASSEMBLY, ELITE™ SERIES, RELAY BOARD
2=1		
D11117	REV. B	SH. 1 OF 1

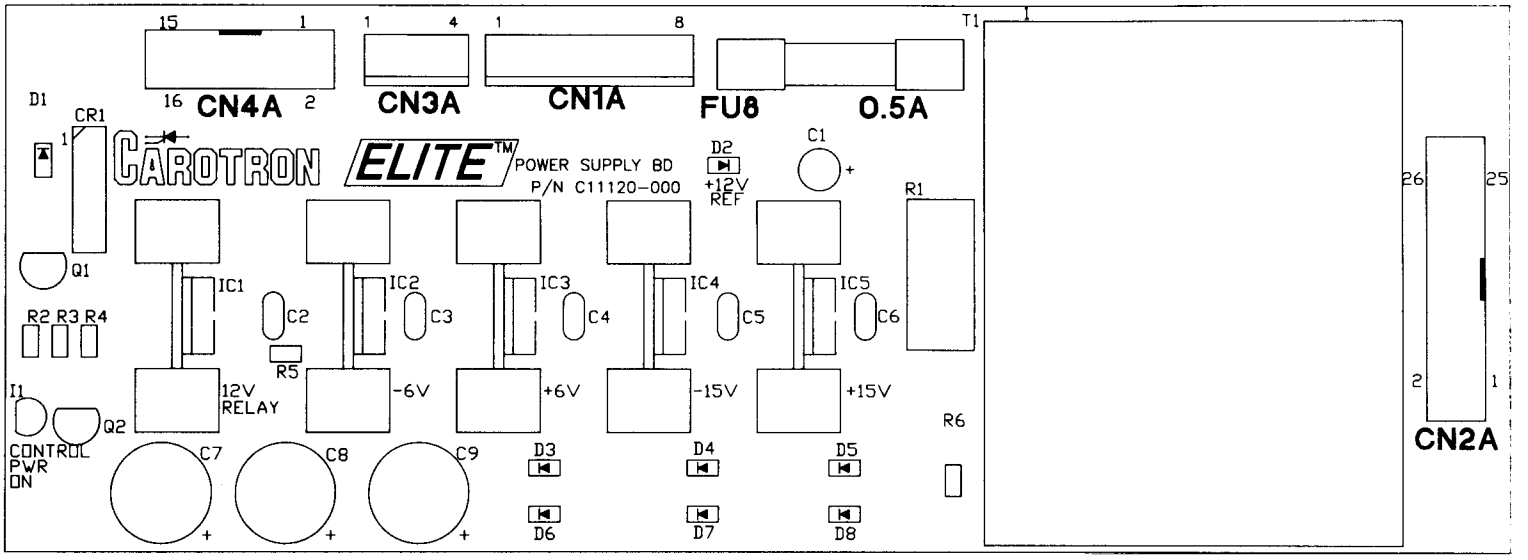


NOTES:
1. REF. B.O.M. A11120-000
2. REF. ASSY. C11120

REV. C, 11-15-94
REV. B, ECO 247, 10-21-93
REV. A, ECO 226, 7-27-93

DRAWN BY: BKP	DATE: 4-8-93
APPROVED BY:	DATE:
TOLERANCES: ± 2 DEC. PL. ± 3 DEC. PL.	
SCALE:	TITLE: SCHEMATIC, ELITE® POWER SUPPLY BOARD
DRAWING NUMBER: C11118	REV. C SH. 1 OF 1

CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063

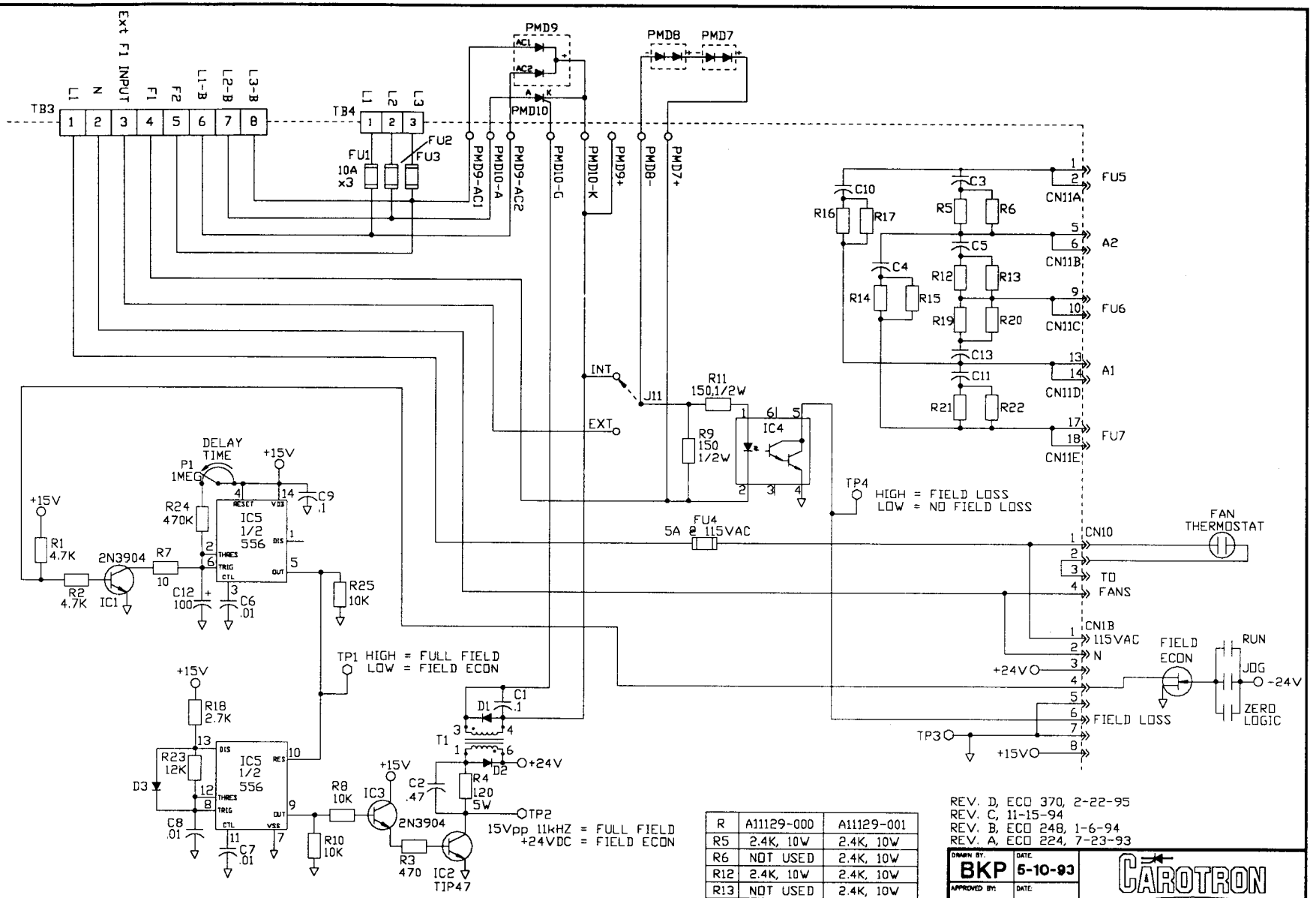


NOTES:

1. REF. SCHEMATIC C11118
2. REF. B.O.M. A11120

REV. B, ECO 247, 2-8-94
REV. A, ECO 226, 7-27-93

DRAWN BY: BKP	DATE: 5-10-93	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.		TITLE: ELITE™, ASSEMBLY POWER SUPPLY BOARD
SCALE: 2=1		
DRAWING NUMBER: C11120	REV. B	SH. 1 OF 1



R	A11129-000	A11129-001
R5	2.4K, 10W	2.4K, 10W
R6	NOT USED	2.4K, 10W
R12	2.4K, 10W	2.4K, 10W
R13	NOT USED	2.4K, 10W
R14	2.4K, 10W	2.4K, 10W
R15	NOT USED	2.4K, 10W
R16	2.4K, 10W	2.4K, 10W
R17	NOT USED	2.4K, 10W
R19	2.4K, 10W	2.4K, 10W
R20	NOT USED	2.4K, 10W
R21	2.4K, 10W	2.4K, 10W
R22	NOT USED	2.4K, 10W

NOTES:

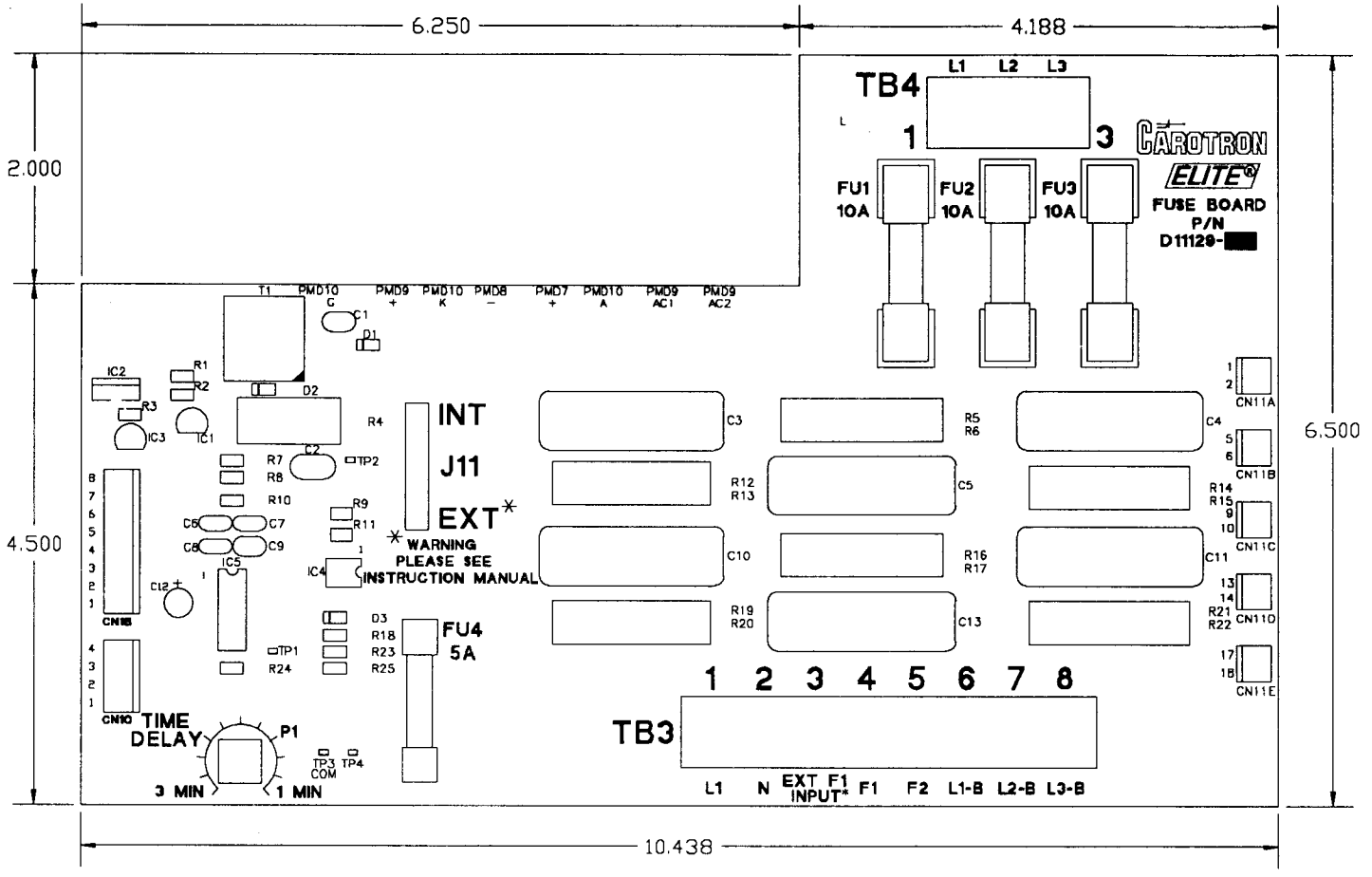
1. REF. B.O.M. A11129-000 FOR 20 & 40 HP MODELS.
   REF. B.O.M. A11129-001 FOR 60-300 HP MODELS.
2. REF. ASSY. D11129.

REV. D, ECO 370, 2-22-95
REV. C, 11-15-94
REV. B, ECO 248, 1-6-94
REV. A, ECO 224, 7-23-93

DRAWN BY: BKP	DATE: 5-10-93
APPROVED BY:	DATE:
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.	
SCALE:	
DRAWING NUMBER: C11127	REV. D SH. 1 OF 1

CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6083

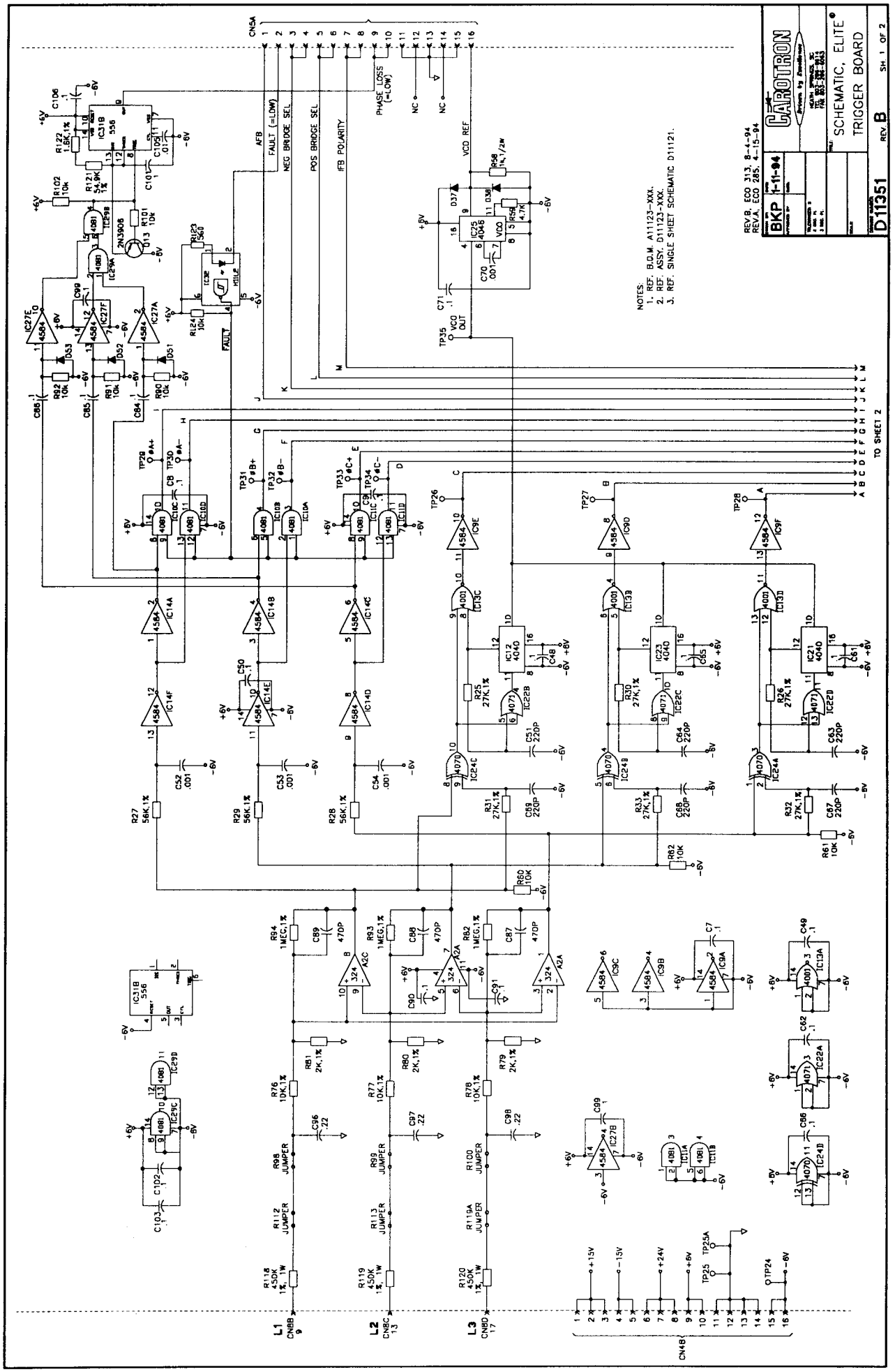
TITLE: SCHEMATIC, ELITE® FUSE BOARD

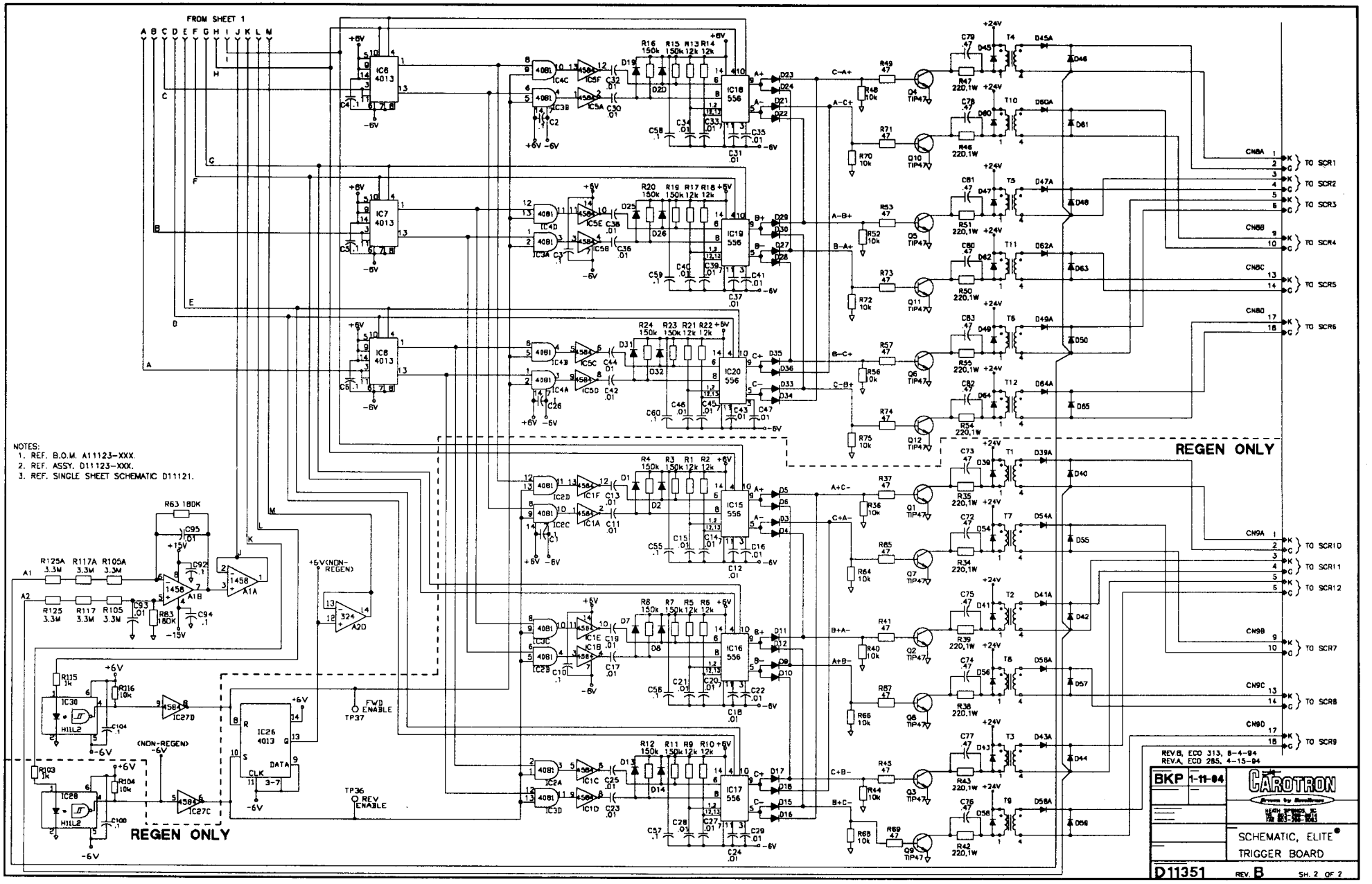


NOTES:
1. REF. SCHEMATIC C11127
2. REF. B.O.M. A11129-000 FOR 20-40 HP MODELS.
   REF. B.O.M. A11129-001 FOR 60-300 HP MODELS.

REV. D, ECO 373, 3-8-95
REV. C, ECO 278, 1-13-94
REV. B, ECO 224, 7-23-93

WRM 6-10-93	CAROTRON	
	ASSEMBLY, ELITE® FUSE BOARD	
2=1		
D11129	REV. D	SH. 1 OF 1

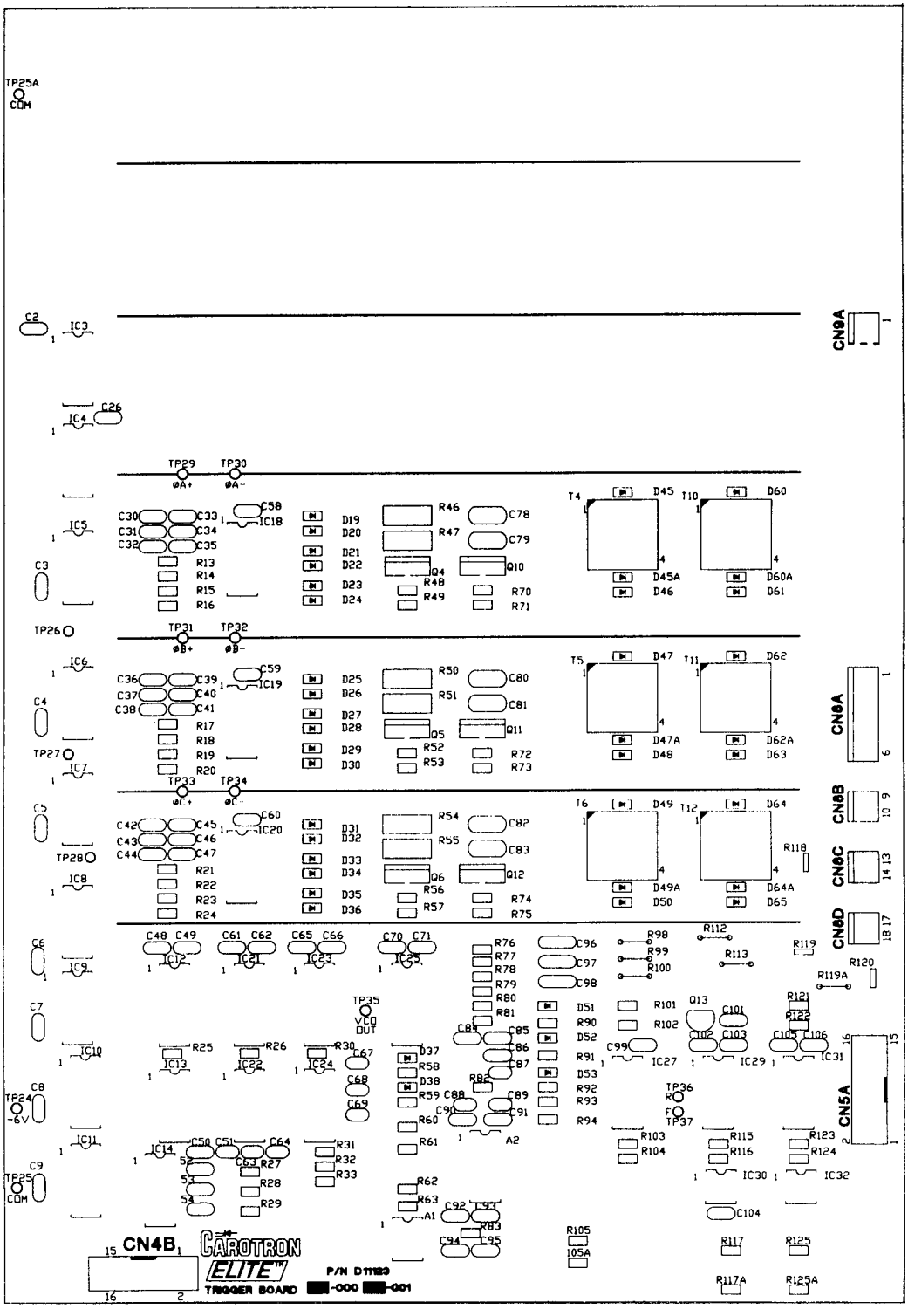

CAROTRON
SCHEMATIC, ELITE®
TRIGGER BOARD
D11351
REV B
SH 1 OF 2
REV.B, ECO 313, 8-4-94
REV.A, ECO 285, 4-15-94
BKP 1-11-94
NOTES:
1. REF. B.O.M. A11123-XXX.
2. REF. ASSY. D11123-XXX.
3. REF. SINGLE SHEET SCHEMATIC D11121.
TO SHEET 2
AFB
FAULT (=LOW)
NEG BRIDGE SEL
POS BRIDGE SEL
IFB POLARITY
PHASE LOSS (=LOW)
VCO REF
NC
FAULT
VCO OUT
L1
L2
L3
CN8B
CN8C
CN8D
CN4B
+15V
-15V
+24V
+6V
-6V


FROM SHEET 1
NOTES:
1. REF. B.O.M. A11123-XXX.
2. REF. ASSY. D11123-XXX.
3. REF. SINGLE SHEET SCHEMATIC D11121.
REGEN ONLY
REGEN ONLY
REV.B, ECO 313, 8-4-94
REV.A, ECO 285, 4-15-94
BKP 1-11-94
CAROTRON
SCHEMATIC, ELITE®
TRIGGER BOARD
D11351
REV. B
SH. 2 OF 2

REV. C, ECO 313, 8-4-94
REV. B, ECO 285, 4-28-94
REV. A, ECO 229, 8-13-93

BKP	5-10-93	CAROTRON	ELITE™, ASSEMBLY
			E06 TRIGGER BOARD
	2=1	D11123-000	REV. C SH. 1 OF 1

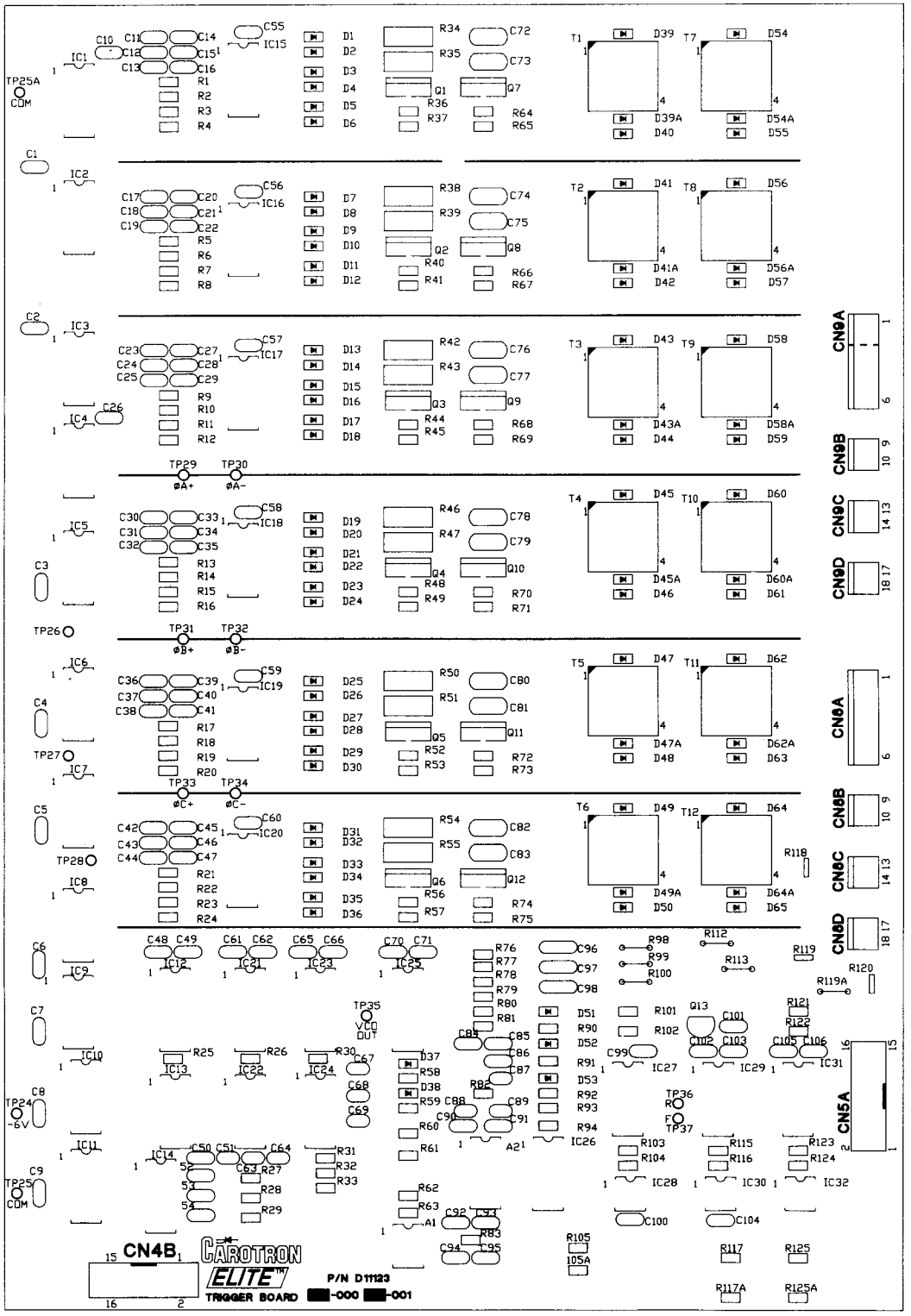
NOTES:
1. REF. SINGLE PAGE SCH. D11121.
2. REF. TWO PAGE SCH. D11351.
3. REF. B.O.M. A11123-000.

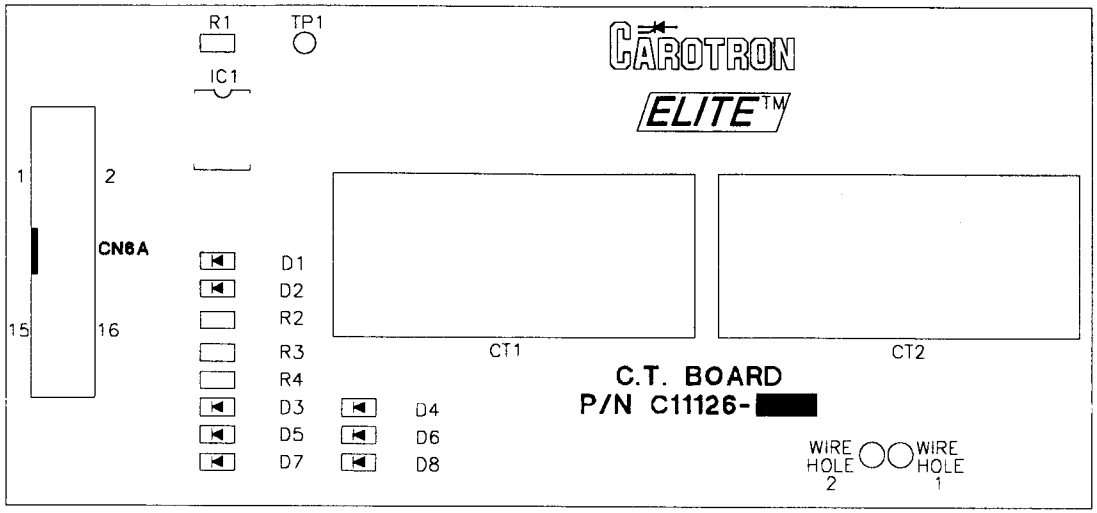


REV. C, ECO 313, 8-4-94
REV. B, ECO 285, 4-28-94
REV. A, ECO 229, 8-13-93

DRAWN BY WRM	DATE 5-10-93	CAROTRON Driven by Excellence	TITLE ELITE™, ASSEMBLY E12 TRIGGER BOARD
APPROVED BY	DATE	HEATH SPRINGS, SC TEL: 803-286-8614 FAX: 803-286-8083	
TOLERANCES: X 2 DEC PL 3 DEC PL		SCALE 2=1	SIZE D11123-001 REV. C SH. 1 OF 1

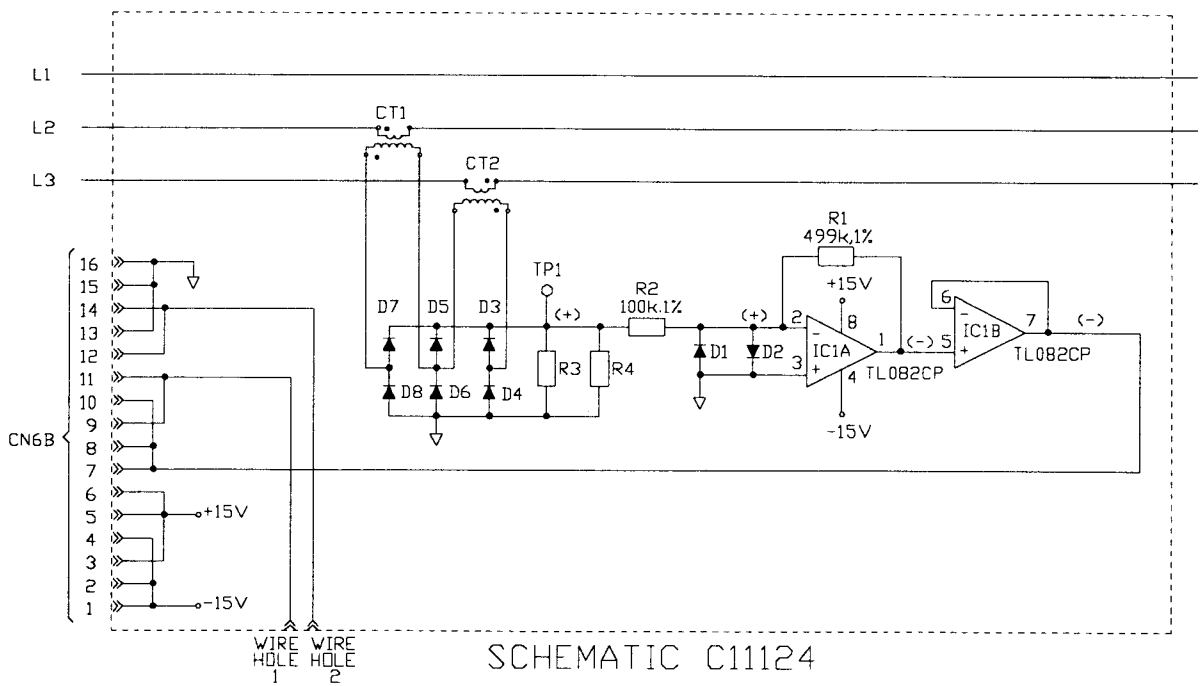
NOTES:
1. REF. SINGLE PAGE SCH. D11121.
2. REF. TWO PAGE SCH. D11351.
3. REF. B.O.M. A11123-001.





ASSEMBLY C11126

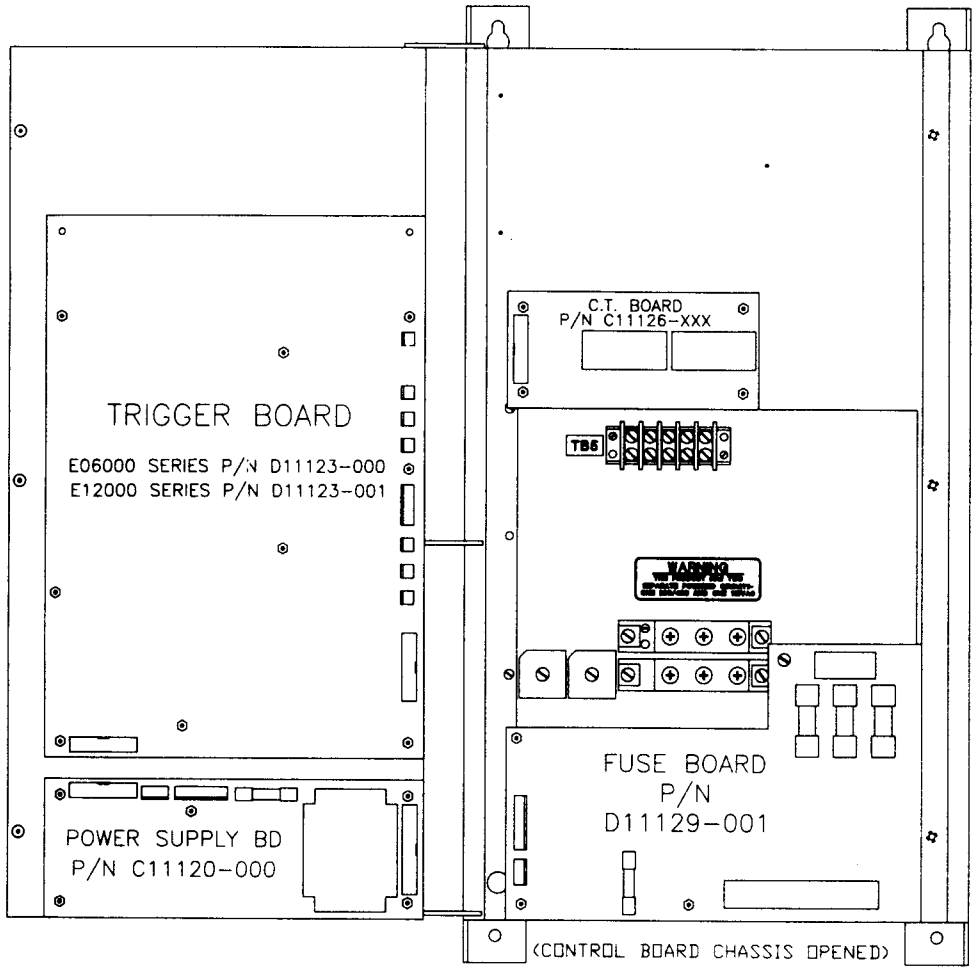
NOTES:
1. C.T.'S 1 & 2 NOT USED ON -007,-008, OR -009 ASSEMBLIES.

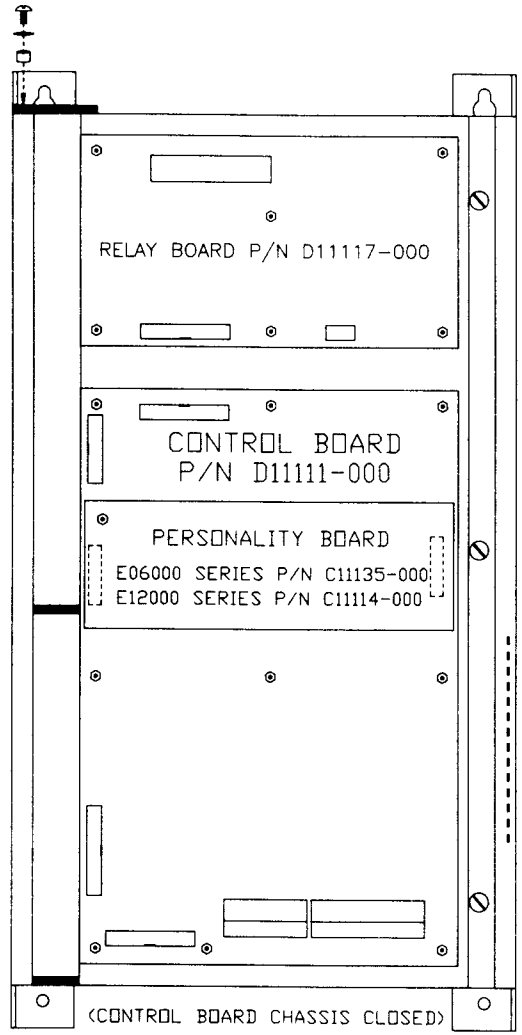


SCHEMATIC C11124

ASSY.	HP	R3	R4
A11126-000	10/20	243 OHMS	374 OHMS
A11126-001	20/40	73.2 OHMS	NOT USED
A11126-002	30/60	100 OHMS	100 OHMS
A11126-003	40/75	68 OHMS	84 OHMS
A11126-004	50/100	57 OHMS	57 OHMS
A11126-005	60/125	47 OHMS	47 OHMS
A11126-006	75/150	20 OHMS	NOT USED
A11126-007	100/200	34 OHMS	34 OHMS
A11126-008	125/250	28 OHMS	28 OHMS
A11126-009	150/300	23.7 OHMS	23.7 OHMS

DRAWN BY: BKP	DATE: 12/2/94	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.		TITLE: SCHEMATIC & ASSEMBLY, ELITE® C.T. BC
SCALE:		
DRAWING NUMBER: C11592	REV. A	SH. 1 OF 1

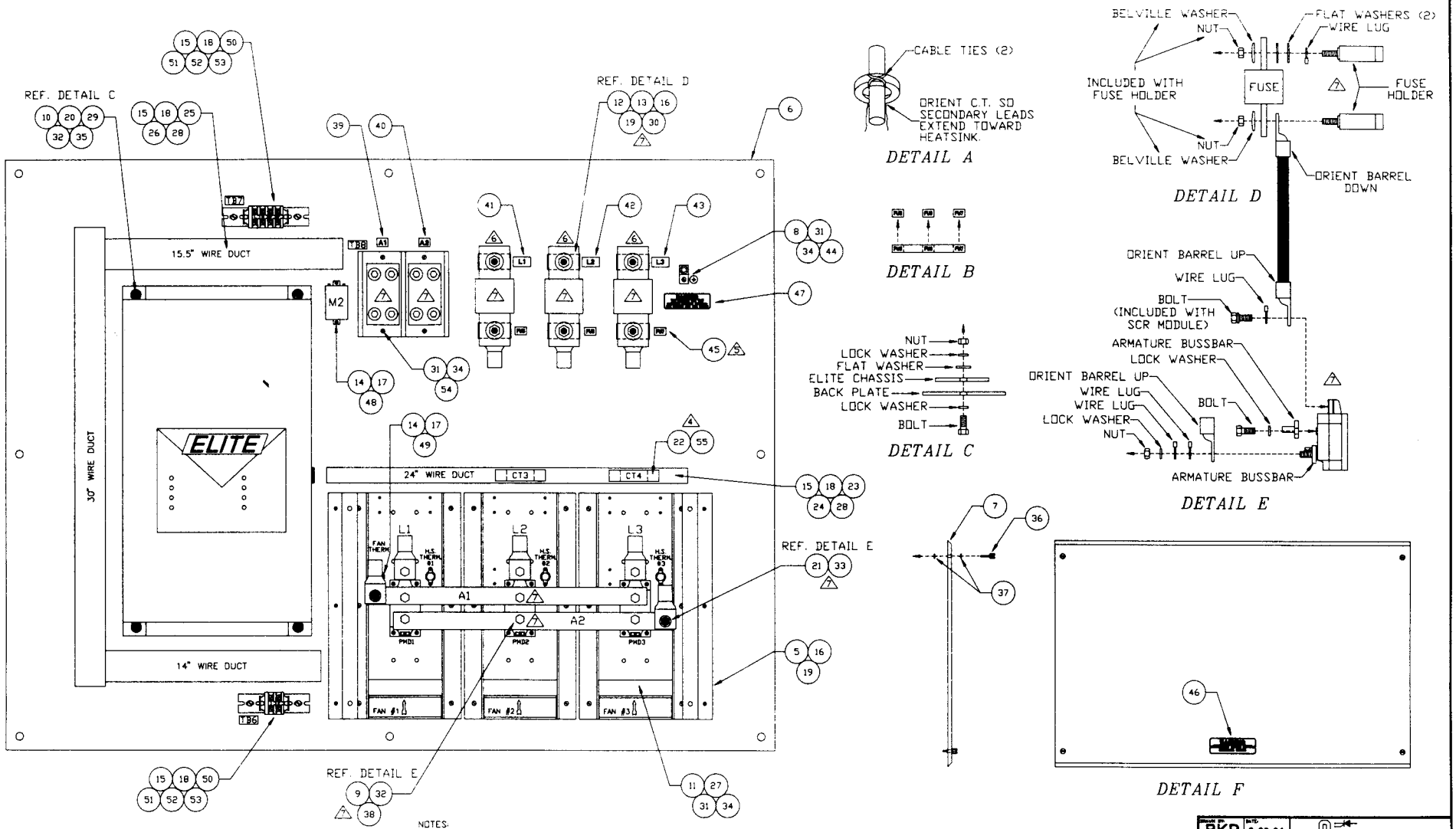




NOTES:

1. REF. B.O.M. A11506-000 FOR E06200-000 MODELS.
   REF. B.O.M. A11506-001 FOR E06250-000 MODELS.
   REF. B.O.M. A11506-002 FOR E06300-000 MODELS.
   REF. B.O.M. A11507-000 FOR E12200-000 MODELS.
   REF. B.O.M. A11507-001 FOR E12250-000 MODELS.
   REF. B.O.M. A11507-002 FOR E12300-000 MODELS.
2. REF. WIRE LIST A11514.
3. REF. WIRING DIAGRAM D11510 FOR E06000 SERIES MODELS.
   REF. WIRING DIAGRAM D11511 FOR E12000 SERIES MODELS.

BKP	12/2/94	CAROTRON
		GENERAL ASSEMBLY, ELITE MAIN CHASSIS E06 & E12 200 - 300 HP MODELS
D11598	REV.	SH. 1 OF 1



DETAIL A

DETAIL B

DETAIL C

DETAIL D

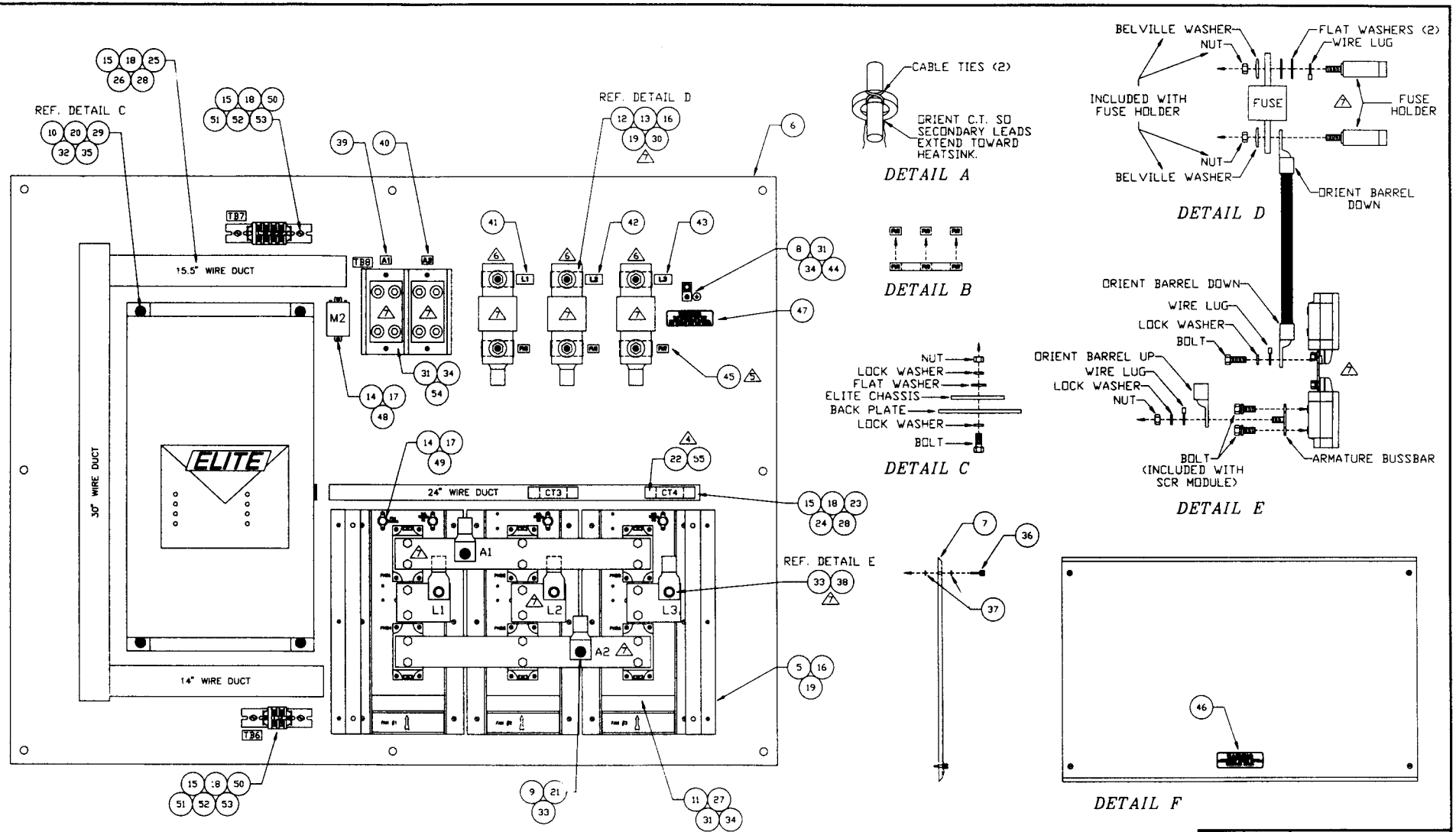
DETAIL E

DETAIL F

NOTES:
1. POWER & CABLE ASSEMBLIES NOT SHOWN.
2. REF. B.O.M. A11512-000 & WIRE LIST A11531 FOR E06200-000.
   REF. B.O.M. A11512-001 & WIRE LIST A11532 FOR E06250-000.
   REF. B.O.M. A11512-002 & WIRE LIST A11533 FOR E06300-000.
3. REF. WIRING DIAGRAM D11510.
4. REF. DETAIL A FOR MOUNTING AND PROPER ORIENTATION OF CT'S.

5. CUT LAB1059-00 IN 3 PIECES BEFORE MOUNTING. REF. DETAIL B.
6. MOUNT THE TOP FUSE HOLDER IN THE LOWER POSITION ON MODELS E06200-000 & E06250-000. USE THE UPPER POSITION ON MODEL E06300-000. REF. DETAIL D FOR OTHER MOUNTING INFORMATION.
7. TORQUE ALL POWER CONNECTIONS AS FOLLOWS:
   POWER MODULES/BUSSBARS = 106 INCH-LBS.
   FUSE BLOCKS = 192 INCH-LBS.
   TERMINAL BLOCK = 275 INCH-LBS.

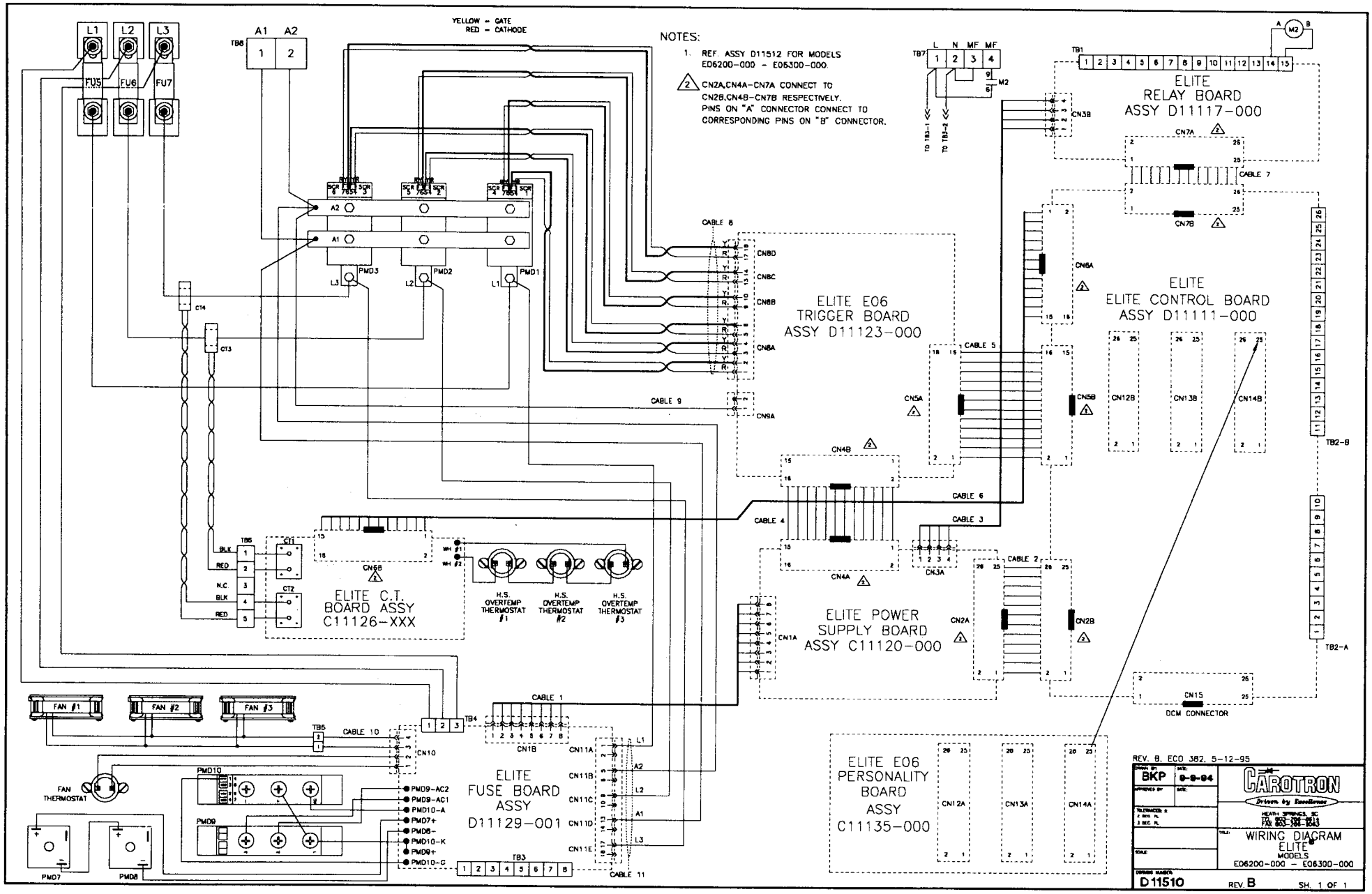
DRAWN BY: BKP	DATE: 9-22-04	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: X ± INCH PL. X ± INCH PL.		TITLE: FINAL ASSEMBLY ELITE® MODELS E06200-000 ~ E06300-000
SCALE: 1 = 3		
DRAWING NUMBER: D11512	REV.	SH. 1 OF 1

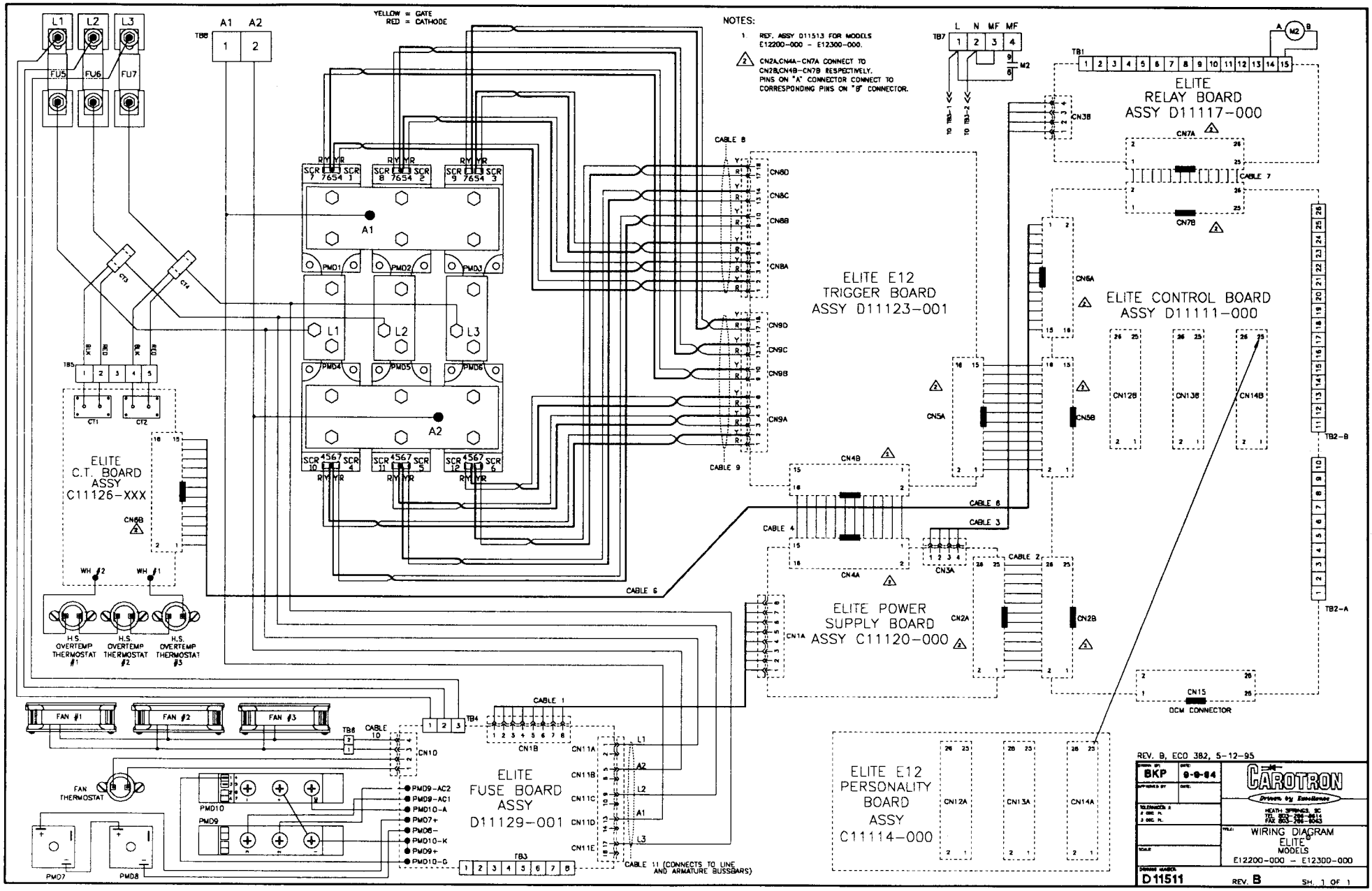


NOTES:

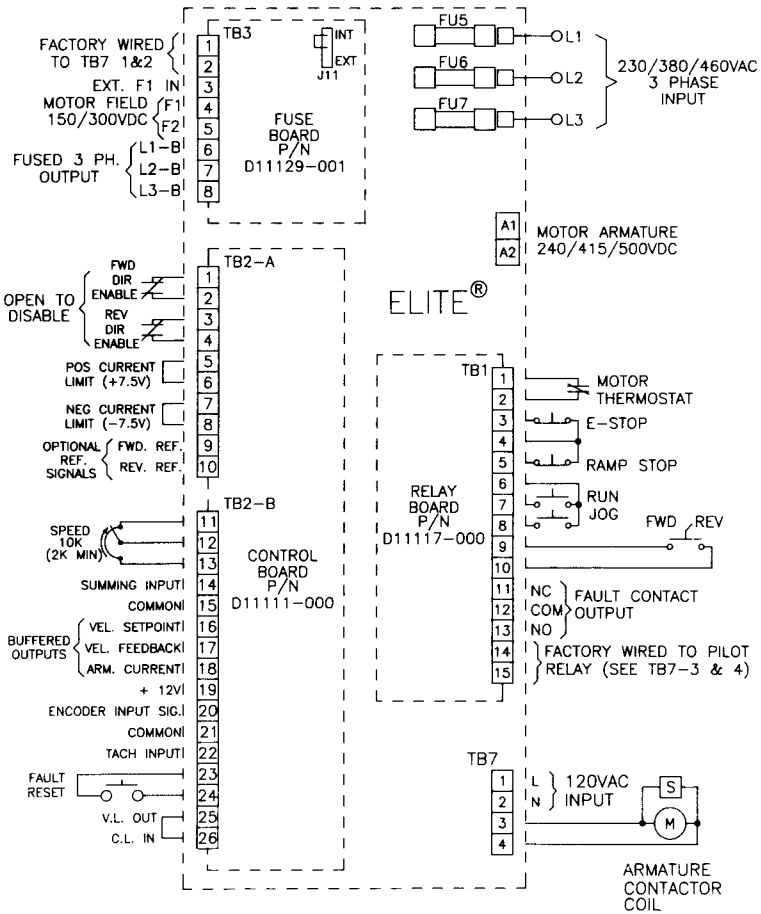
1. POWER & CABLE ASSEMBLIES NOT SHOWN.
2. REF. B.O.M. A11513-000 & WIRE LIST A11534 FOR E12200-000.
   REF. B.O.M. A11513-001 & WIRE LIST A11535 FOR E12250-000.
   REF. B.O.M. A11513-002 & WIRE LIST A11536 FOR E12300-000.
3. REF. WIRING DIAGRAM D11511.
4. REF. DETAIL A FOR MOUNTING AND PROPER ORIENTATION OF CT'S.
5. CUT LAB1059-00 IN 3 PIECES BEFORE MOUNTING. REF. DETAIL B.
6. MOUNT THE TOP FUSE HOLDER IN THE LOWER POSITION ON MODELS E12200-000 & E12250-000. USE THE UPPER POSITION ON MODEL E12300-000. REF. DETAIL D FOR OTHER MOUNTING INFORMATION.
7. TORQUE ALL POWER CONNECTIONS AS FOLLOWS:
   POWER MODULES/BUSSBARS = 106 INCH-LBS.
   FUSE BLOCKS = 192 INCH-LBS.
   TERMINAL BLOCK = 275 INCH-LBS.

DRAWN BY: BKP	DATE: 10-3-94	CAROTRON, Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-4611 FAX 803-286-4063
TOLERANCES: ± DEC PL. ± DEC PL.		
SCALE: 1 = 3		TITLE: FINAL ASSEMBLY ELITE® MODELS E12200-000 - E12300-000
DRAWING NUMBER: D11513	REV.	SH. 1 OF 1

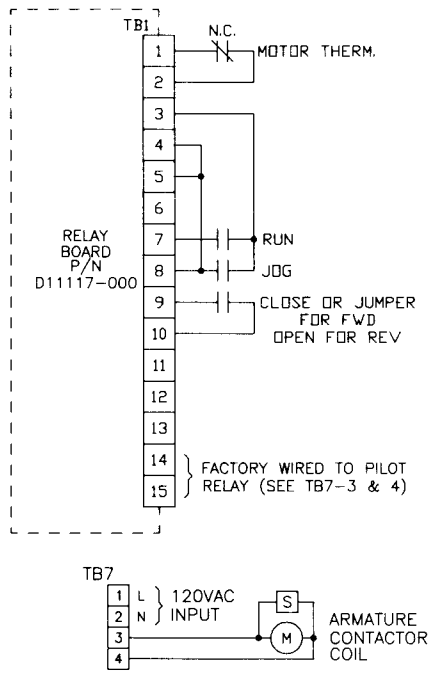

NOTES:
1. REF. ASSY D11512 FOR MODELS E06200-000 - E06300-000.
2 CN2A,CN4A-CN7A CONNECT TO CN2B,CN4B-CN7B RESPECTIVELY. PINS ON "A" CONNECTOR CONNECT TO CORRESPONDING PINS ON "B" CONNECTOR.
YELLOW = GATE
RED = CATHODE
ELITE RELAY BOARD ASSY D11117-000
ELITE ELITE CONTROL BOARD ASSY D11111-000
ELITE E06 TRIGGER BOARD ASSY D11123-000
ELITE POWER SUPPLY BOARD ASSY C11120-000
ELITE C.T. BOARD ASSY C11126-XXX
ELITE FUSE BOARD ASSY D11129-001
ELITE E06 PERSONALITY BOARD ASSY C11135-000
H.S. OVERTEMP THERMOSTAT #1
H.S. OVERTEMP THERMOSTAT #2
H.S. OVERTEMP THERMOSTAT #3
FAN #1
FAN #2
FAN #3
FAN THERMOSTAT
DCM CONNECTOR
CABLE 1
CABLE 2
CABLE 3
CABLE 4
CABLE 5
CABLE 6
CABLE 7
CABLE 8
CABLE 9
CABLE 10
CABLE 11
REV. B, ECO 382, 5-12-95
CAROTRON
WIRING DIAGRAM ELITE MODELS E06200-000 - E06300-000
D11510
REV. B
SH. 1 OF 1


YELLOW = GATE
RED = CATHODE
NOTES:
1. REF. ASSY D11513 FOR MODELS E12200-000 - E12300-000.
2. CN2A,CN4A-CN7A CONNECT TO CN2B,CN4B-CN7B RESPECTIVELY. PINS ON "A" CONNECTOR CONNECT TO CORRESPONDING PINS ON "B" CONNECTOR.
ELITE RELAY BOARD ASSY D11117-000
ELITE E12 TRIGGER BOARD ASSY D11123-001
ELITE CONTROL BOARD ASSY D11111-000
ELITE POWER SUPPLY BOARD ASSY C11120-000
ELITE C.T. BOARD ASSY C11126-XXX
ELITE FUSE BOARD ASSY D11129-001
ELITE E12 PERSONALITY BOARD ASSY C11114-000
CABLE 1
CABLE 2
CABLE 3
CABLE 4
CABLE 6
CABLE 7
CABLE 8
CABLE 9
CABLE 10
CABLE 11 (CONNECTS TO LINE AND ARMATURE BUSSBARS)
OCM CONNECTOR
FAN #1
FAN #2
FAN #3
FAN THERMOSTAT
H.S. OVERTEMP THERMOSTAT #1
H.S. OVERTEMP THERMOSTAT #2
H.S. OVERTEMP THERMOSTAT #3
PMD7
PMD8
PMD9
PMD10
REV. B, ECO 382, 5-12-95
BKP
9-9-94
CAROTRON
Driven by Excellence
WIRING DIAGRAM ELITE® MODELS E12200-000 - E12300-000
D11511
REV. B
SH. 1 OF 1

ELITE GENERAL CONNECTIONS

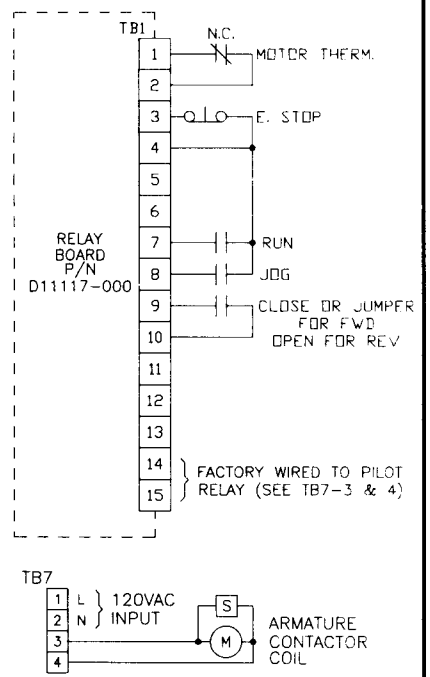


ELITE SINGLE CONTACT CONTROL FOR DYNAMIC BRAKE OR COAST TO STOP



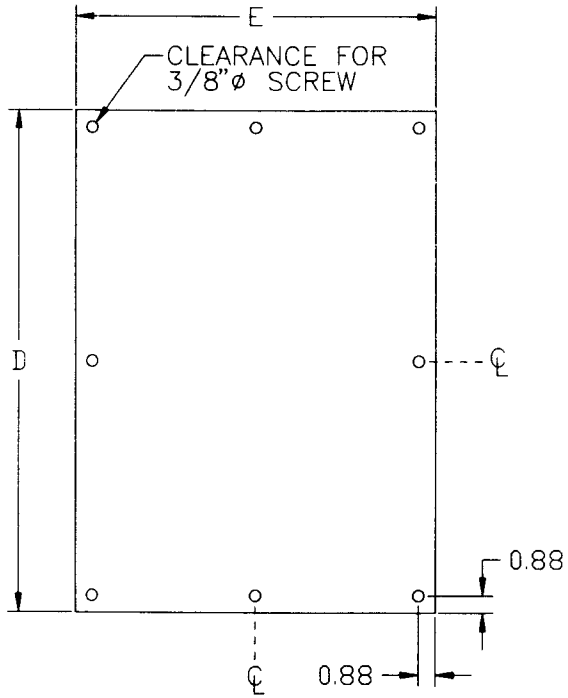
SINGLE CONTACT (MAINTAINED) CONTROL FOR RUN AND JOG FUNCTIONS.

ELITE SINGLE CONTACT CONTROL FOR RAMP TO STOP OPERATION

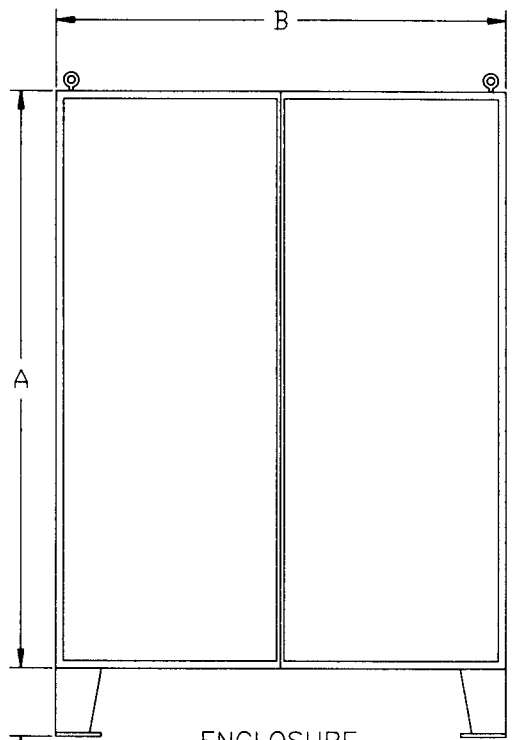


SINGLE CONTACT (MAINTAINED) CONTROL FOR RUN AND JOG FUNCTIONS.

DRAWN BY: BKP	DATE: 10-24-94	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.		TITLE: GENERAL CONNECTIONS FOR ELITE,® 200-300 HP MODELS
SCALE:		
DRAWING NUMBER: C11564	REV.	SH. 1 OF 1



PANEL



ENCLOSURE
TWO DOOR

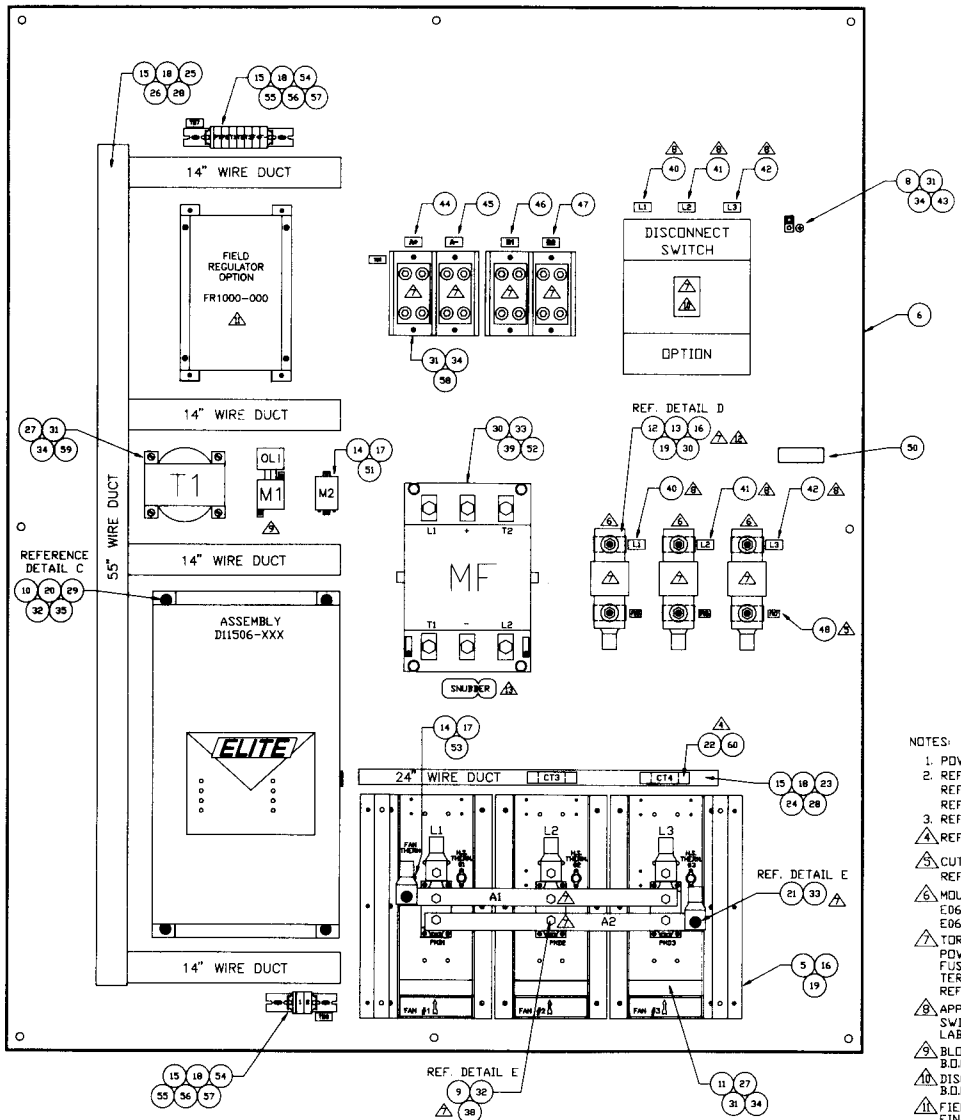
PANEL DIMENSIONS		
OPTIONAL DASH NO.	D x E	NOTES:
C200-C300	68 x 56	

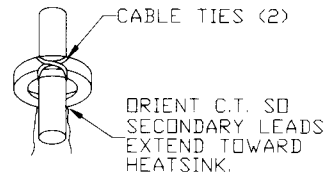
NEMA 1 ENCLOSURE DIMENSIONS		
OPTIONAL DASH NO.	A x B x C	NOTES
004, H05 & H06	72 x 60 x 16	TWO DOOR FLOOR MOUNT

C = DEPTH

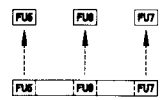
NOTE:
1. ALL DIMENSIONS ARE IN INCHES.
2. ENCLOSURES INCLUDE COOLING FAN PACKAGE.

BKP	10-25-94	CAROTRON
		ELITE® OPTION CHASSIS AND ENCLOSURE DIMENSIONS C200-C300 HP MODELS
D11568	REV.	SH. 1 OF 1

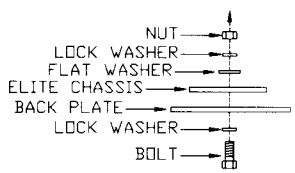




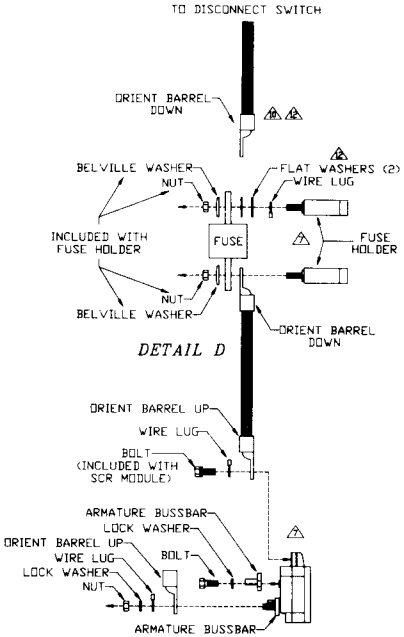
DETAIL A



DETAIL B



DETAIL C

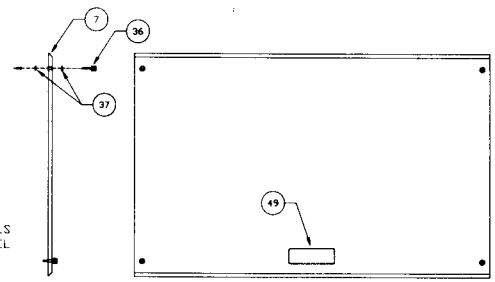


DETAIL D

DETAIL E

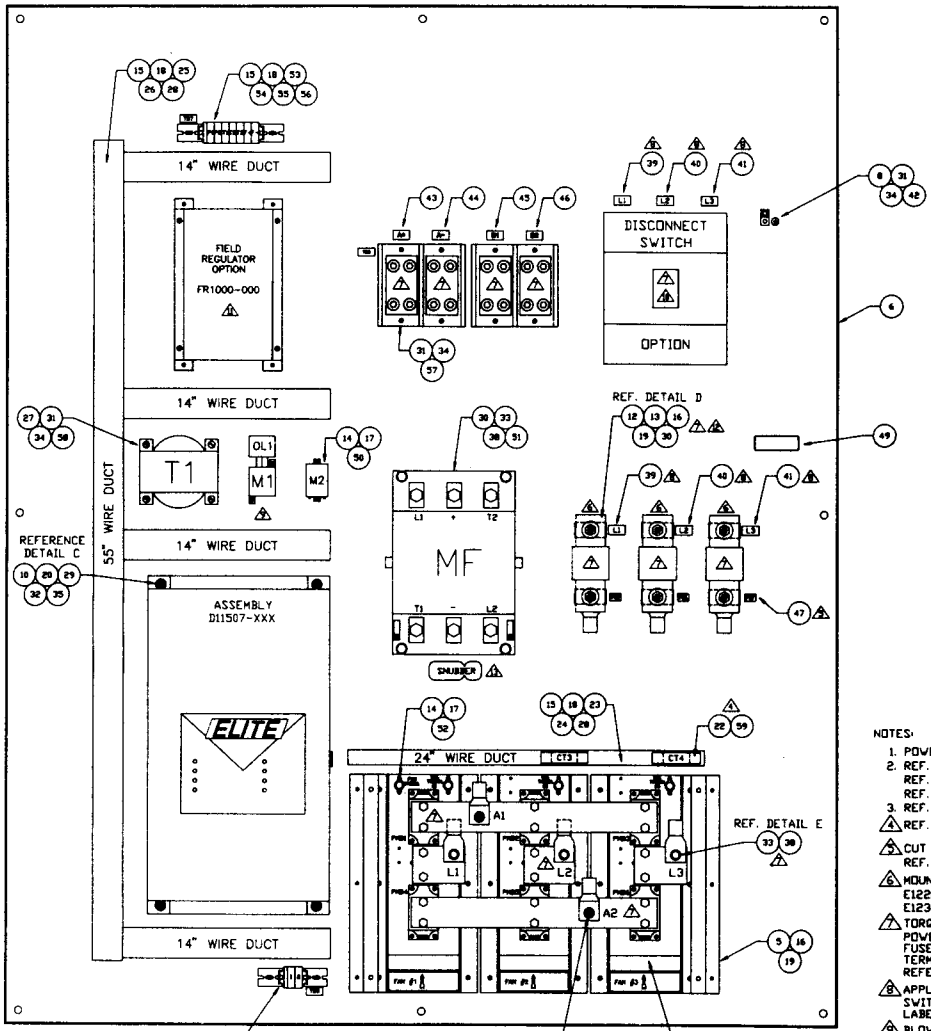
NOTES:

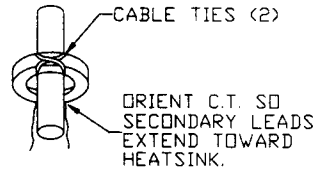
1. POWER & CABLE ASSEMBLIES NOT SHOWN.
2. REF. B.O.M. A11552-000 & WIRE LIST A11554 FOR E06200-C200.
   REF. B.O.M. A11552-001 & WIRE LIST A11555 FOR E06250-C250.
   REF. B.O.M. A11552-002 & WIRE LIST A11556 FOR E06300-C300.
3. REF. WIRING DIAGRAM D11560.
4. REF. DETAIL A FOR MOUNTING AND PROPER ORIENTATION OF CT'S.
5. CUT LAB1059-00 IN 3 PIECES BEFORE MOUNTING. REF. DETAIL B.
6. MOUNT THE TOP FUSE HOLDER IN THE LOWER POSITION ON MODELS E06200-C200 & E06250-C250. USE THE UPPER POSITION ON MODEL E06300-C300. REF. DETAIL D FOR OTHER MOUNTING INFORMATION.
7. TORQUE ALL POWER CONNECTIONS AS FOLLOWS:
   POWER MODULES/BUSSBARS = 106 INCH-LBS.
   FUSE BLOCKS = 192 INCH-LBS.
   TERMINAL BLOCK = 275 INCH-LBS.
   REFER TO DISCONNECT LABEL FOR ITS TIGHTENING TORQUE.
8. APPLY L1, L2, & L3 LABELS ABOVE THE DISCONNECT SWITCH OPTION, IF USED. OTHERWISE, APPLY LABELS BESIDE FUSES.
9. BLOWER STARTER OPTION ONLY, E612BS-XXX. B.O.M. A11333-XXX.
10. DISCONNECT SWITCH OPTION ONLY, E612DS-XXX. B.O.M. A11332-XXX.
11. FIELD REGULATOR OPTION ONLY, FR1000-000. FINAL ASSY B.O.M. A11222-XXX.
12. INSTALL WIRE LUG BARREL DOWN IN PLACE OF THE (2) 3/8" FLAT WASHERS WHEN DISCONNECT SWITCH OPTION IS USED.
13. CONNECT SNUBBER ACROSS CONTACTOR COIL.



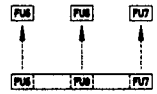
DETAIL F

DRAWN BY: BKP	DATE: 10-7-04	CAROTRON — Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: X ± .XX, .XXX ± .005		TITLE: ASSEMBLY, ELITE® CONTACTOR OPTION CHASSIS MODELS E06200-C200 - E06300-C300
SCALE:		DRAWING NUMBER: D11552 REV. SH. 1 OF 1

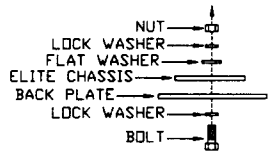




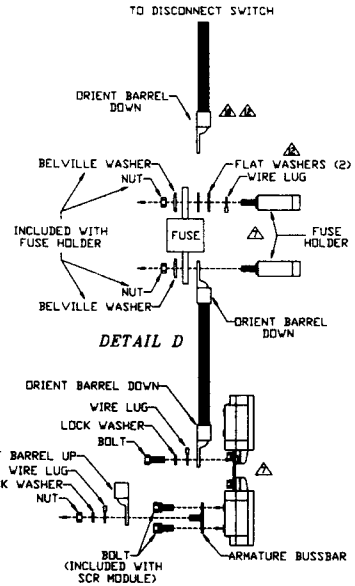
DETAIL A



DETAIL B

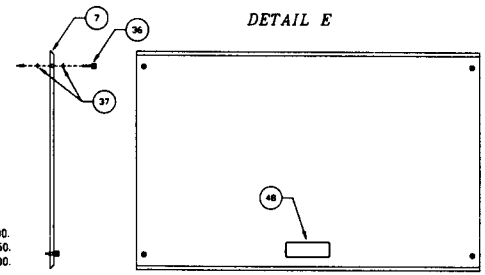


DETAIL C



DETAIL D

DETAIL E



DETAIL F

NOTES:

1. POWER & CABLE ASSEMBLIES NOT SHOWN.
2. REF. B.O.M. A11553-000 & WIRE LIST A11557 FOR E12200-C200.
   REF. B.O.M. A11553-001 & WIRE LIST A11558 FOR E12250-C250.
   REF. B.O.M. A11553-002 & WIRE LIST A11559 FOR E12300-C300.
3. REF. WIRING DIAGRAM D11561.

4. REF. DETAIL A FOR MOUNTING AND PROPER ORIENTATION OF CT'S.

5. CUT LAB1059-00 IN 3 PIECES BEFORE MOUNTING.
   REF. DETAIL B.

6. MOUNT THE TOP FUSE HOLDER IN THE LOWER POSITION ON MODELS E12200-C200 & E12250-C250. USE THE UPPER POSITION ON MODEL E12300-C300. REF. DETAIL D FOR OTHER MOUNTING INFORMATION.

7. TORQUE ALL POWER CONNECTIONS AS FOLLOWS:
   POWER MODULES/BUSSBARS = 106 INCH-LBS.
   FUSE BLOCKS = 192 INCH-LBS.
   TERMINAL BLOCK = 275 INCH-LBS.
   REFER TO DISCONNECT LABEL FOR ITS TIGHTENING TORQUE.

8. APPLY L1, L2, & L3 LABELS ABOVE THE DISCONNECT SWITCH OPTION, IF USED. OTHERWISE, APPLY LABELS BESIDE FUSES.

9. BLOWER STARTER OPTION ONLY, E612BS-XXX.
   B.O.M. A11333-XXX.

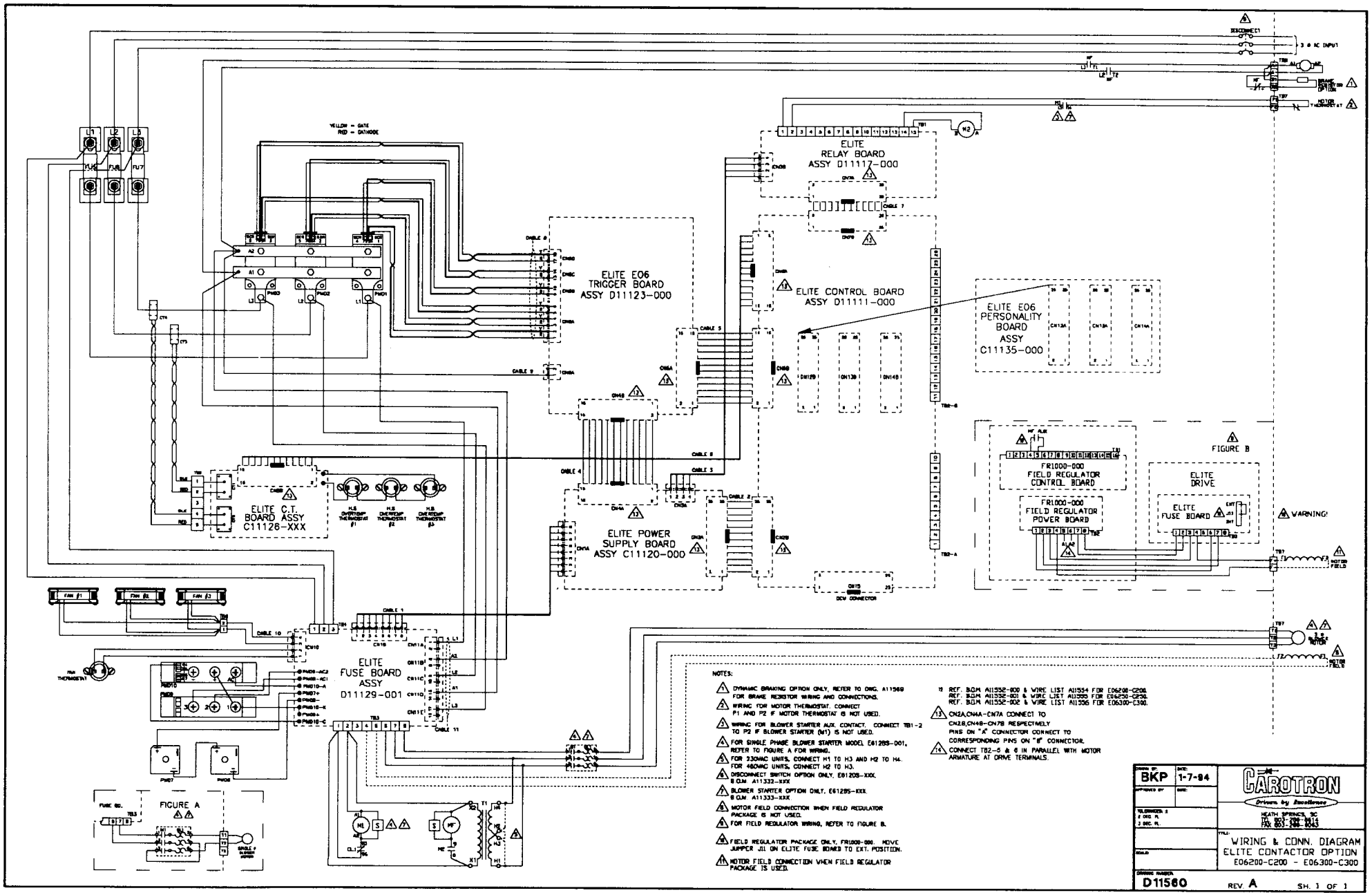
10. DISCONNECT SWITCH OPTION ONLY, E612DS-XXX.
    B.O.M. A11332-XXX.

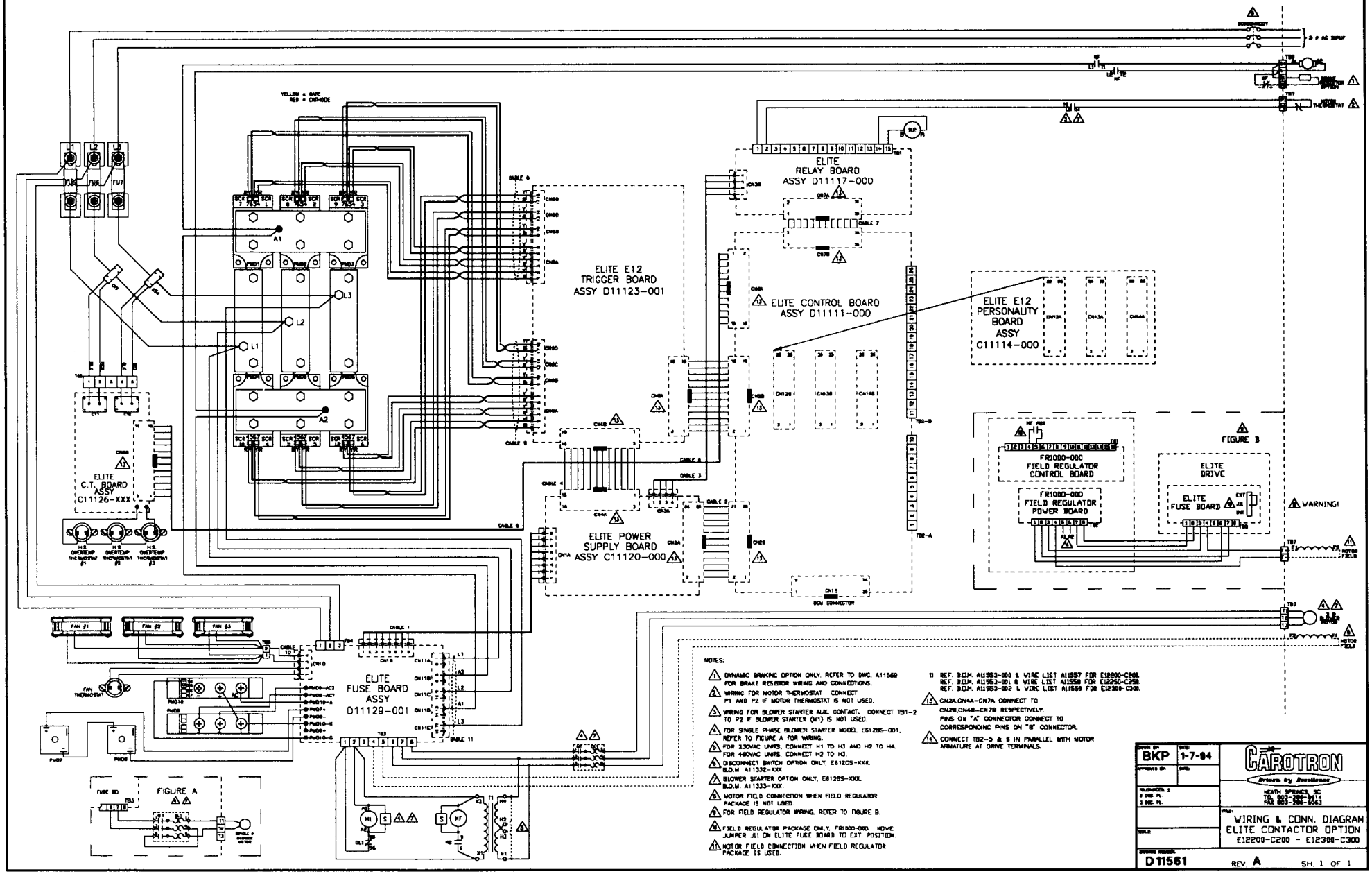
11. FIELD REGULATOR OPTION ONLY, FR1000-000.
    FINAL ASSY B.O.M. A11222-XXX.

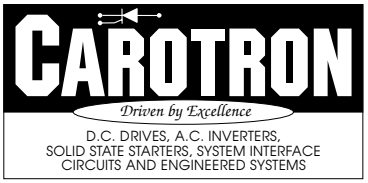
12. INSTALL WIRE LUG BARREL DOWN IN PLACE OF THE (2) 3/8" FLAT WASHERS WHEN DISCONNECT SWITCH OPTION IS USED.

13. CONNECT SNUBBER ACROSS CONTACTOR COIL.

DRAWN BY: BKP	DATE: 10-17-84	CAROTRON Driven by Excellence	
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8811 FAX 803-286-8813	
REVISIONS: 4 DEC. PL. = .XXX 3 DEC. PL. = .XXX		TITLE: ASSEMBLY, ELITE® CONTACTOR OPTION CHASSIS MODELS E12200-C200 - E12300-C300	
SCALE:			
DRAWING NUMBER: D11553	REV.	SH. 1 OF 1	


ELITE RELAY BOARD ASSY D11117-000
ELITE E06 TRIGGER BOARD ASSY D11123-000
ELITE CONTROL BOARD ASSY D11111-000
ELITE E06 PERSONALITY BOARD ASSY C11135-000
ELITE C.T. BOARD ASSY C11126-XXX
ELITE POWER SUPPLY BOARD ASSY C11120-000
ELITE FUSE BOARD ASSY D11129-001
FR1000-000 FIELD REGULATOR CONTROL BOARD
FR1000-000 FIELD REGULATOR POWER BOARD
ELITE DRIVE
ELITE FUSE BOARD
FIGURE A
FIGURE B
WARNING!
NOTES:
1. DYNAMIC BRAKING OPTION ONLY, REFER TO DWG. A11569 FOR BRAKE RESISTOR WIRING AND CONNECTIONS.
2. WIRING FOR MOTOR THERMOSTAT. CONNECT P1 AND P2 IF MOTOR THERMOSTAT IS NOT USED.
3. WIRING FOR BLOWER STARTER AUX. CONTACT. CONNECT TB1-2 TO P2 IF BLOWER STARTER (M1) IS NOT USED.
4. FOR SINGLE PHASE BLOWER STARTER MODEL E61295-001, REFER TO FIGURE A FOR WIRING.
5. FOR 230VAC UNITS, CONNECT H1 TO H3 AND H2 TO H4. FOR 460VAC UNITS, CONNECT H2 TO H3.
6. DISCONNECT SWITCH OPTION ONLY, E61208-XXX. B.O.M. A11332-XXX
7. BLOWER STARTER OPTION ONLY, E61295-XXX. B.O.M. A11333-XXX
8. MOTOR FIELD CONNECTION WHEN FIELD REGULATOR PACKAGE IS NOT USED.
9. FOR FIELD REGULATOR WIRING, REFER TO FIGURE B.
10. FIELD REGULATOR PACKAGE ONLY, FR1000-000. MOVE JUMPER J11 ON ELITE FUSE BOARD TO EXT. POSITION.
11. MOTOR FIELD CONNECTION WHEN FIELD REGULATOR PACKAGE IS USED.
12. REF. BOM A11552-000 & WIRE LIST A11554 FOR E06200-C200. REF. BOM A11552-001 & WIRE LIST A11555 FOR E06250-C250. REF. BOM A11552-002 & WIRE LIST A11556 FOR E06300-C300.
13. CN2A,CN4A-CN7A CONNECT TO CN2B,CN4B-CN7B RESPECTIVELY. PINS ON "A" CONNECTOR CONNECT TO CORRESPONDING PINS ON "B" CONNECTOR.
14. CONNECT TB2-5 & 6 IN PARALLEL WITH MOTOR ARMATURE AT DRIVE TERMINALS.
DRAWN BY: BKP
DATE: 1-7-94
CAROTRON
Drives by Excellence
HEATH SPRINGS, SC
PH. 803-286-8143
FAX 803-286-8043
WIRING & CONN. DIAGRAM
ELITE CONTACTOR OPTION
E06200-C200 - E06300-C300
DRAWING NUMBER: D11560
REV A
SH. 1 OF 1


ELITE
RELAY BOARD
ASSY D11117-000
ELITE E12
TRIGGER BOARD
ASSY D11123-001
ELITE CONTROL BOARD
ASSY D11111-000
ELITE E12
PERSONALITY
BOARD
ASSY
C11114-000
ELITE
C.T. BOARD
ASSY
C11126-XXX
ELITE POWER
SUPPLY BOARD
ASSY C11120-000
ELITE
FUSE BOARD
ASSY
D11129-001
FR1000-000
FIELD REGULATOR
CONTROL BOARD
FR1000-000
FIELD REGULATOR
POWER BOARD
ELITE
DRIVE
ELITE
FUSE BOARD
FIGURE A
FIGURE B
WARNING!
NOTES:
1 DYNAMIC BRAKING OPTION ONLY. REFER TO DWG. A11569 FOR BRAKE RESISTOR WIRING AND CONNECTIONS.
2 WIRING FOR MOTOR THERMOSTAT. CONNECT P1 AND P2 IF MOTOR THERMOSTAT IS NOT USED.
3 WIRING FOR BLOWER STARTER AUX. CONTACT. CONNECT TB1-2 TO P2 IF BLOWER STARTER (M1) IS NOT USED.
4 FOR SINGLE PHASE BLOWER STARTER MODEL E61285-001, REFER TO FIGURE A FOR WIRING.
5 FOR 230VAC UNITS, CONNECT H1 TO H3 AND H2 TO H4. FOR 460VAC UNITS, CONNECT H2 TO H3.
6 DISCONNECT SWITCH OPTION ONLY, E61205-XXX. B.O.M. A11332-XXX
7 BLOWER STARTER OPTION ONLY, E61285-XXX. B.O.M. A11333-XXX.
8 MOTOR FIELD CONNECTION WHEN FIELD REGULATOR PACKAGE IS NOT USED.
9 FOR FIELD REGULATOR WIRING, REFER TO FIGURE B.
10 FIELD REGULATOR PACKAGE ONLY, FR1000-000. MOVE JUMPER J11 ON ELITE FUSE BOARD TO EXT. POSITION.
11 MOTOR FIELD CONNECTION WHEN FIELD REGULATOR PACKAGE IS USED.
12 REF. B.O.M. A11553-000 & WIRE LIST A11557 FOR E12200-C200.
REF. B.O.M. A11553-001 & WIRE LIST A11558 FOR E12250-C250.
REF. B.O.M. A11553-002 & WIRE LIST A11559 FOR E12300-C300.
13 CN2A,CN4A-CN7A CONNECT TO CN2B,CN4B-CN7B RESPECTIVELY. PINS ON "A" CONNECTOR CONNECT TO CORRESPONDING PINS ON "B" CONNECTOR.
14 CONNECT TB2-5 & 8 IN PARALLEL WITH MOTOR ARMATURE AT DRIVE TERMINALS.
BKP
1-7-94
CAROTRON
Drives by Excellence
HEATH SPRINGS SC
TEL 803-286-8414
FAX 803-384-6063
WIRING & CONN. DIAGRAM
ELITE CONTACTOR OPTION
E12200-C200 - E12300-C300
D11561
REV. A
SH. 1 OF 1



3204 Rocky River Road
Heath Springs, SC 29058
Phone: (803) 286-8614
Fax: (800) 286-6063

MAN1000-1A
Issued 7-1-95