

ELITE[®]PRO

Digital D.C. Drive V3

Instruction Manual

Models

EP2020-000	EP4020-000
EP2040-000	EP4040-000
EP2060-000	EP4060-000
EP2075-000	EP4075-000
EP2100-000	EP4100-000
EP2125-000	EP4125-000
EP2150-000	EP4150-000
EP2200-000	EP4200-000
EP2250-000	EP4250-000
EP2300-000	EP4300-000
EP2400-000	EP4400-000
EP2500-000	EP4500-000
EP2600-000	EP4600-000
EP2700-000	EP4700-000



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® Pro V3 Series is Carotron's 3rd generation of microprocessor based D.C. motor controls. The series provides control of speed and torque control of 5-700HP D.C. motors rated for NEMA type "C" power supplies. The EP2 (non-regenerative) series and the EP4 (regenerative) series are offered in compact panel mounted assemblies.

2

Specifications

2.1 Electrical

A.C. Input Voltage Range

- 3 phase, 230-460 VAC $\pm 10\%$, 50/60 Hz ± 2 Hz
- 1 phase, 115 VAC $\pm 10\%$, 50/60 Hz ± 2 Hz, 5A

A.C. Line Field Supply - 1 Phase (Optional)

- 230-460 VAC $\pm 10\%$, 50/60 Hz ± 2 Hz

Armature Output

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

Field Output

- Voltage
 - 0-200VDC @ 230 VAC input
 - 0-330VDC @ 380 VAC input
 - 0-400VDC @ 460 VAC input
- Current
 - EPx020-000 thru EPx060-000: 8A max
 - EPx075-000 thru EPx150-000: 10A max
 - EPx200-000 thru EPx700-000: 12A max

Power Supplies

- +24V (TB1-1): 50mA
- +12V (TB1-17): 100mA
- +10V (TB1-16): 50mA
- -10V (TB1-46): 50mA

Digital Inputs (Qty: 7)

- Sink Mode
 - $V_{ih}=20.0$ VDC max
 - $V_{il}=0.0$ VDC min to 17.0 VDC max
- Source Mode
 - $V_{ih}=8.0$ VDC min to 30.0 VDC max
 - $V_{il}=5.0$ VDC max

Analog Inputs (Qty: 5)

- Voltage Mode
 - Max Input: ± 10 VDC
 - Input Impedance: 1M Ω
- Current Mode
 - Max Input: ± 20 mADC
 - Input Impedance: 250 Ω
- Resolution: 12 bit

Tachometer Feedback Input

- Max Input: ± 200 V (AC or DC)

Encoder Feedback Input

- Frequency: 200kHz max
- Uni-directional (single channel) or Quadrature
- Single ended or differential
- Signal Input Voltage Range: 5-12 VDC

Frequency Input

- Frequency: 40kHz max, square wave
- Voltage: 12 VDC max
 - $V_{il}=0.0$ VDC to 1.5 VDC max
 - $V_{ih}=2.5$ VDC min to 12.0 VDC max

Relay Outputs (Qty: 3)

Form-C contact:

- 2 A @ 115 VAC (resistive)
- 2 A @ 60 VDC (resistive)

Armature Pilot Relay Output

- 30 A @ 120 VAC (resistive)
- 30 A @ 28 VDC (resistive)

Analog Outputs (Qty: 2)

- ± 10 VDC max, 20mADC max
- Resolution: 12 bit + sign

Frequency/Digital Output

- Frequency: 10kHz max, square wave
- Sink current: 100mA max
- Voltage: 30VDC max

Speed Regulation

- Armature Feedback: $\pm 1\%$
- Tachometer Feedback: $\pm 0.01\%$
- Encoder Feedback: $\pm 0.01\%$ (with 1024 min ppr)

Torque Regulation

- $\pm 1\%$ of Range Selected

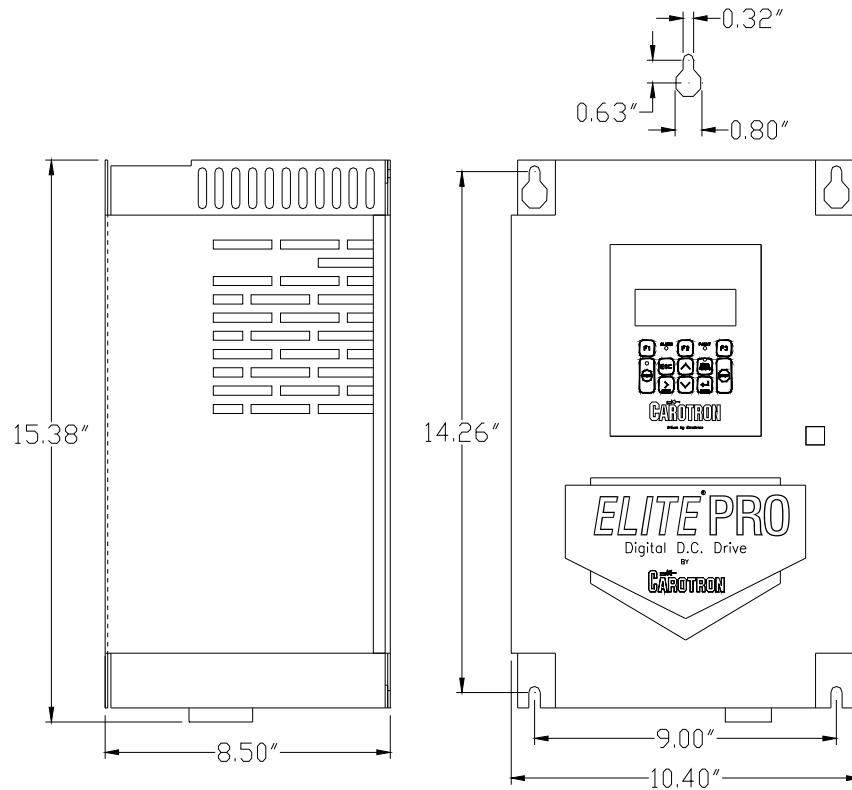
Speed Range

- 100:1 typical when using tachometer or encoder feedback. May be less depending upon motor characteristics

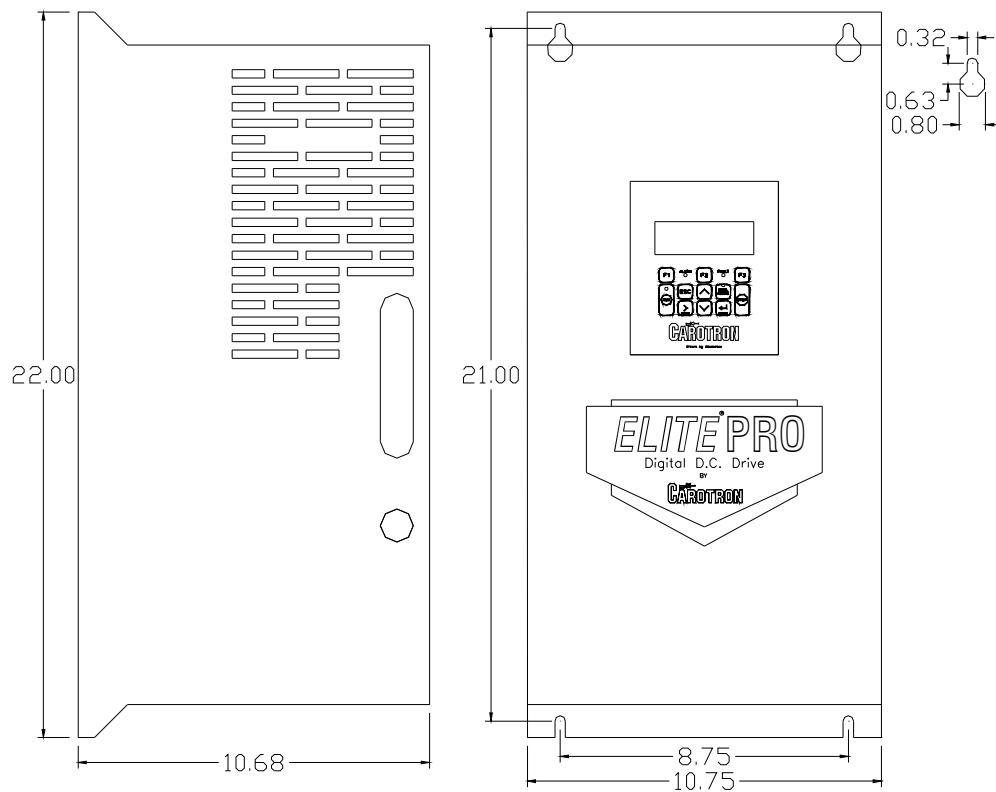
Temperature Range

- Chassis: 0-55°C
- Enclosed: 0-40°C

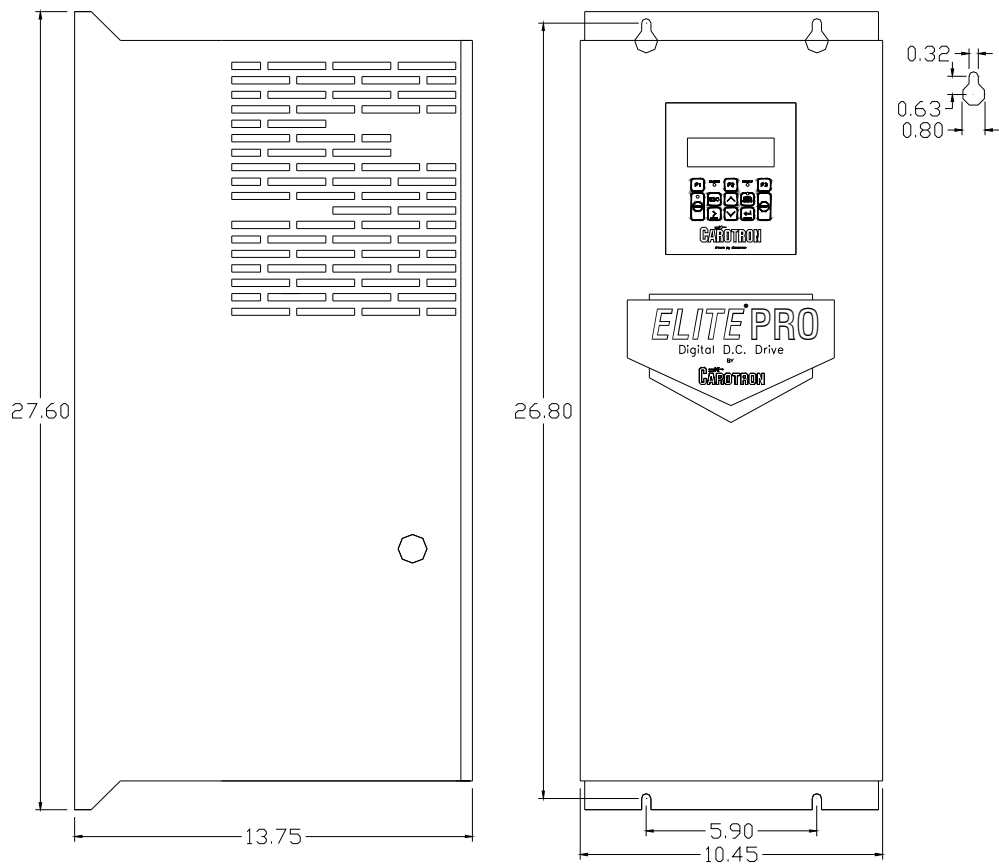
2.2 Physical



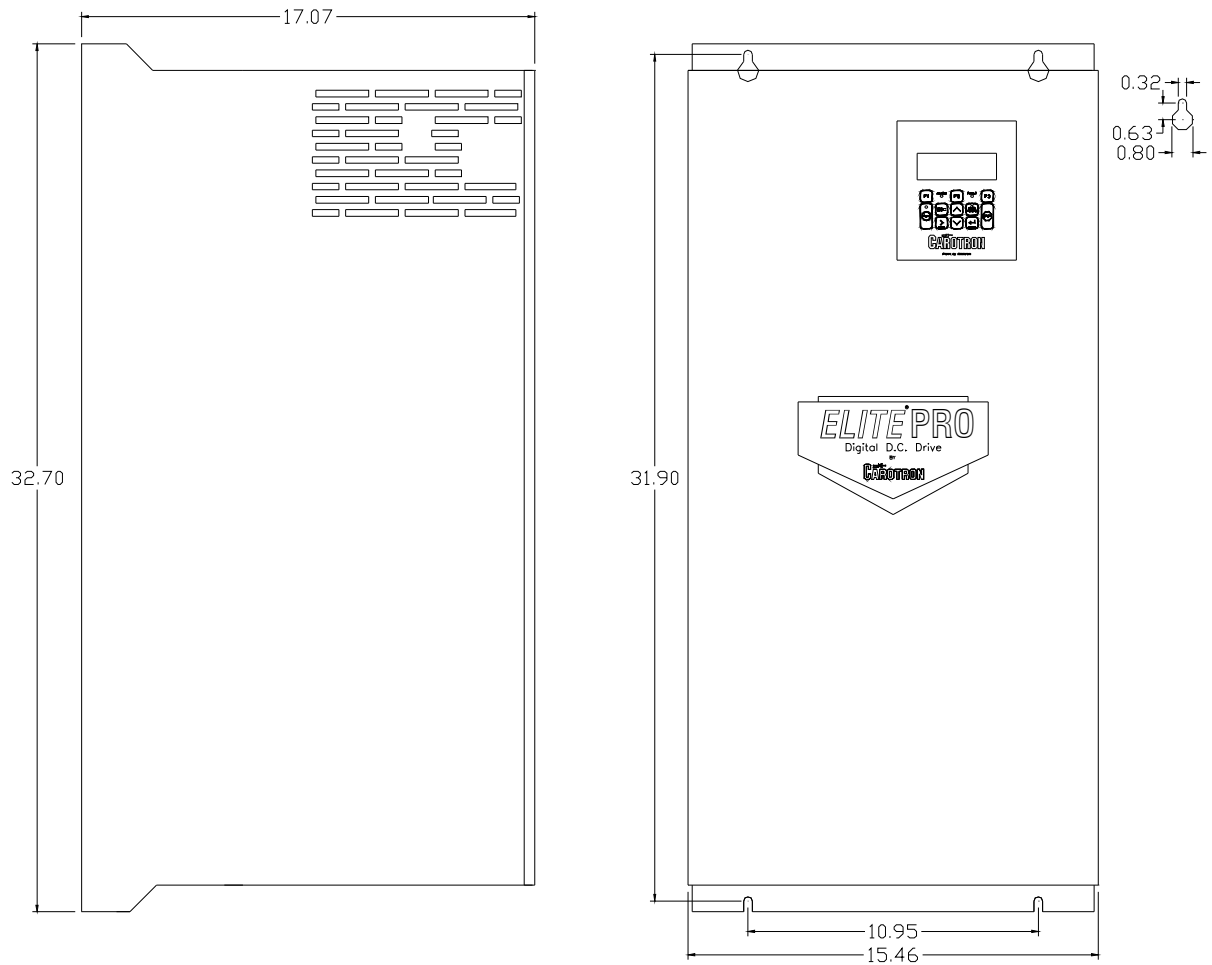
EPx020-000 thru EPx060-000



EPx075-000 thru EPx150-000



EPx200-000 thru EPx400-000



EPx500-000 thru EPx600-000

3

Installation

3.1 Control Installation

Elite Pro 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 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 can cause a heatsink over temperature fault on the Elite Pro 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 terminal strip location.

Use fully insulated and shielded cable for all signal wiring. The shield should be connected at one end only to circuit common. 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, 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 (for AC coils). Diode suppression should be used for DC coils. The suppressor should have short leads and should be connected as close to the coil as possible.

4

Terminal Connections & Functions

4.1 AC Power Connections & Fusing

Terminals L1, L2, and L3 are the AC line inputs for the armature power bridge. High speed semiconductor fuses must be provided externally. Refer to **Figure 1** and **Figure 2** on the next page and Table 21 in the *Spare Parts Section* on page 118 for common manufacturers and part numbers.

In most cases, the drive will use the internal field supply wiring scheme (**Figure 1**). The field bridge is powered from the auxiliary L1 and L2 output terminals via factory installed jumpers. However, in some cases, the field voltage required by a motor exceeds the maximum obtainable field voltage that can be produced using the required AC line voltage for the motor armature. In these cases, an external single phase AC supply for the field bridge must be used. The factory supplied terminal jumpers should be removed and the external supply connects to FL1 and FL2 (**Figure 2**). Note the external supply must be in phase with the L1 and L2 armature supply terminals.

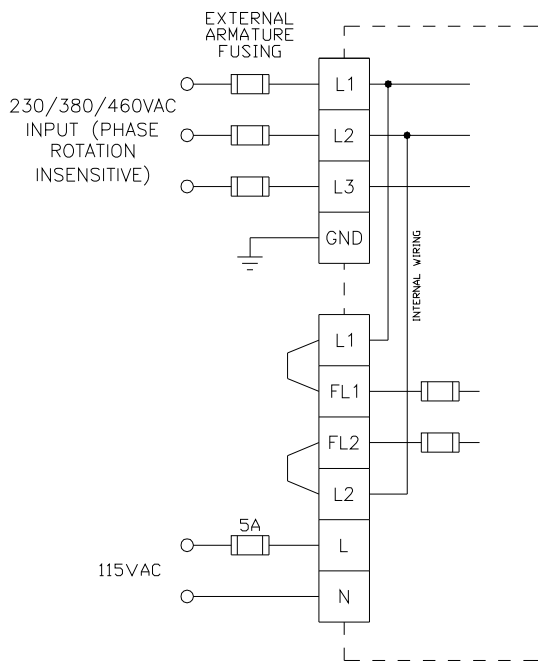


Figure 1: Internal Field Supply Wiring

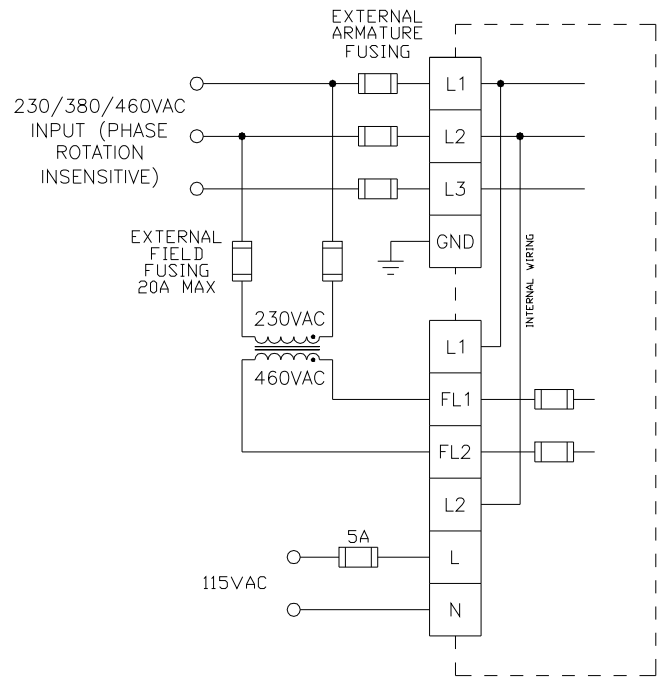


Figure 2: External Field Supply Wiring

For example, consider the motor that has a rated armature voltage of 240VDC and a rated field of 240VDC. The rated armature voltage requires that an input supply of 230VAC be connected to L1, L2, and L3. However, the maximum field voltage attainable from the field bridge using the internal supply would be 200VDC. In order to obtain the required 240VDC field, an external single phase 460VAC supply (obtained via a transformer) can be connected to FL1 and FL2.

The drive also requires a fused single phase 115VAC control power on terminals L and N.

Carotron recommends the use of three phase DIT, drive isolation type transformers. While Elite Pro 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. Refer to Table 1 as a general guide in sizing line supply transformers and wiring.

Drive Model	Arm Volts	Motor HP	Approx. Full Load Line Amps	3 Phase DIT KVA Rating	Arm Amps	Contactor Rating	D.B. Resistor Rating
EPx020-000	240	5	18	7.5	18	40 Amps	10Ω, 300W
		7.5	26	11	28.1		5Ω, 600W
		10	34	14	36		4.4Ω, 750W
	500	5	9	7.5	8.5	40 Amps	40Ω, 375W
		7.5	14	11	13.2		20Ω, 750W
		10	18	14	17.2		20Ω, 750W
EPx040-000	240	15	50	20	55	75 Amps	3Ω, 1000W
		20	65	27	71		2.2Ω, 1500W
		25	40	34	43		7Ω, 2000W
	500	30	47	40	51	75 Amps	6Ω, 2000W
		40	63	51	71		5Ω, 3000W
EPx060-000	240	25	84	34	91.1	110 Amps	1.7Ω, 2000W
		30	98	40	107		
	500	50	78	63	83.7	110 Amps	3.4Ω, 4000W
EPx075-000	240	40	118	51	140	180 Amps	1.3Ω, 2080W
	500	75	106	93		180 Amps	2.6Ω, 4160W
EPx100-000	240	50	148	63	174	180 Amps	0.62Ω, 2232W
	500	100	141	118		180 Amps	1.24Ω, 4464W
EPx125-000	240	60	174	75	206	260 Amps	0.62Ω, 2232W
	500	125	177	145		260 Amps	1.24Ω, 4464W
EPx150-000	240	75	213	93	256	260 Amps	0.62Ω, 2232W
	500	150		175		260 Amps	1.24Ω, 4464W
EPx200-000	240	100	283	118	340	360 Amps	0.47Ω, 4700W
	500	200		220		360 Amps	1.02Ω, 6500W
EPx250-000	240	125	354	145	425	535 Amps	0.37Ω, 5300W
	500	250		275		535 Amps	0.82Ω, 11000W
EPx300-000	240	150	426	175	510	535 Amps	0.31Ω, 7000W
	500	300		330		535 Amps	0.65Ω, 14600W
EPx400-000	240	200	555	220	688	Consult Factory	Consult Factory
	500	400		440		Consult Factory	Consult Factory
EPx500-000	240	250	694	275	850	Consult Factory	Consult Factory
	500	500		550		Consult Factory	Consult Factory
EPx600-000	240	300	832	330	1020	Consult Factory	Consult Factory
	500	600		660		Consult Factory	Consult Factory
EPx700-000	240	350	950	385	1165	Consult Factory	Consult Factory
	500	700		770		Consult Factory	Consult Factory

Table 1: Model Rating Data

x=2 for non-regenerative models

x=4 for regenerative models

4.2 Motor Connections

Field

Most motor fields consist of two windings that are connected in parallel for low voltage operation and in series for high voltage operation. Refer to **Figure 3**. 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 swap 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.

In most cases, when the Elite Pro is supplied with 230VAC, the field should be wired for low voltage operation. When supplied with 460VAC, the motor field is typically wired for high voltage operation. The F1 and F3 leads should always have the same polarity regardless of the mode used.

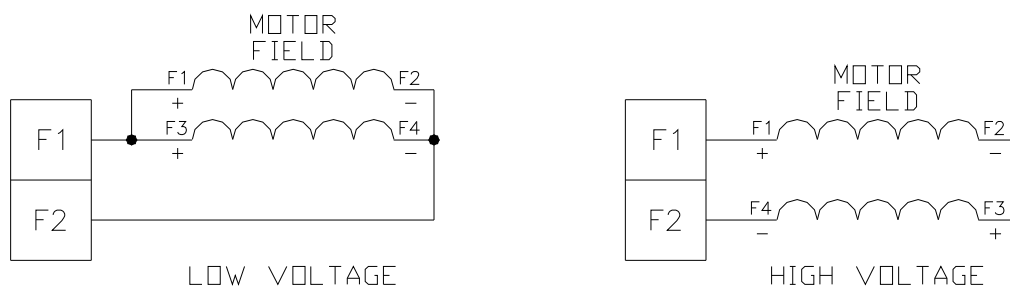


Figure 3

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 1 for typical armature voltage, current, contactor and dynamic braking resistor ratings. **Figure 4** shows a typical armature wiring scheme using a contactor. An optional dynamic braking resistor is also shown.

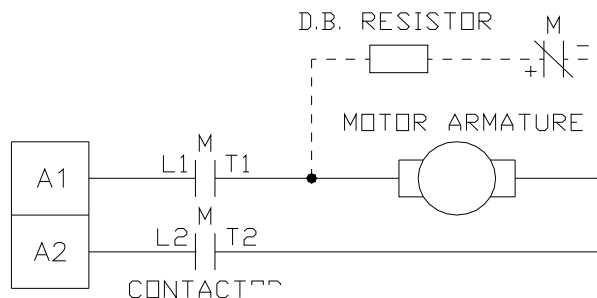


Figure 4

Series Field

When present, the **S1** and **S2** for the **SERIES** field winding is placed in series with the armature leads on **non-regenerative models only**! They should **NOT** be used with the EP4 Series regenerative models. On regenerative models, 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. If during startup the field windings are reversed to change direction of the motor, the series windings should also be reversed to maintain the proper polarity. **Figure 5** shows a typical wiring scheme using the series field with a non-regenerative drive. Note the polarity of the shunt field and series field windings (S1 is positive with respect to S2, F1 is positive with respect to F2).

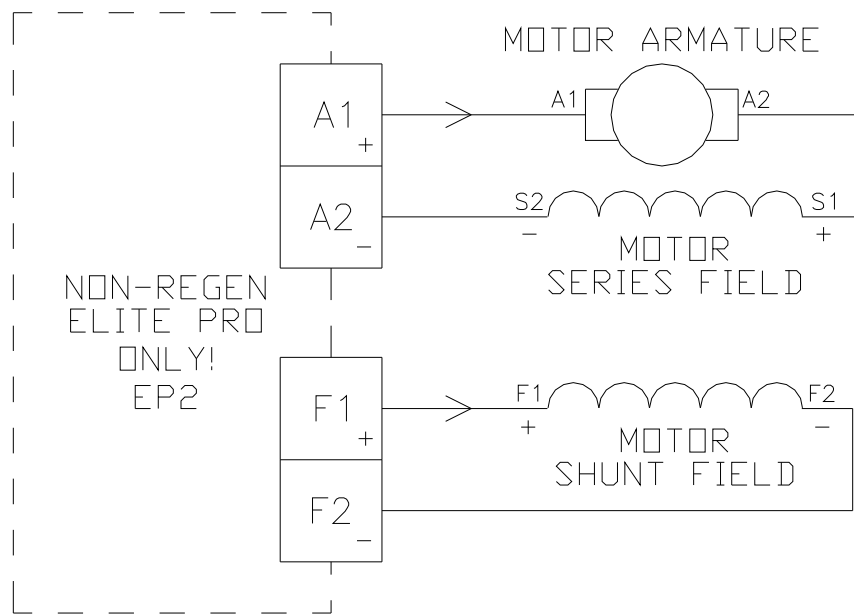


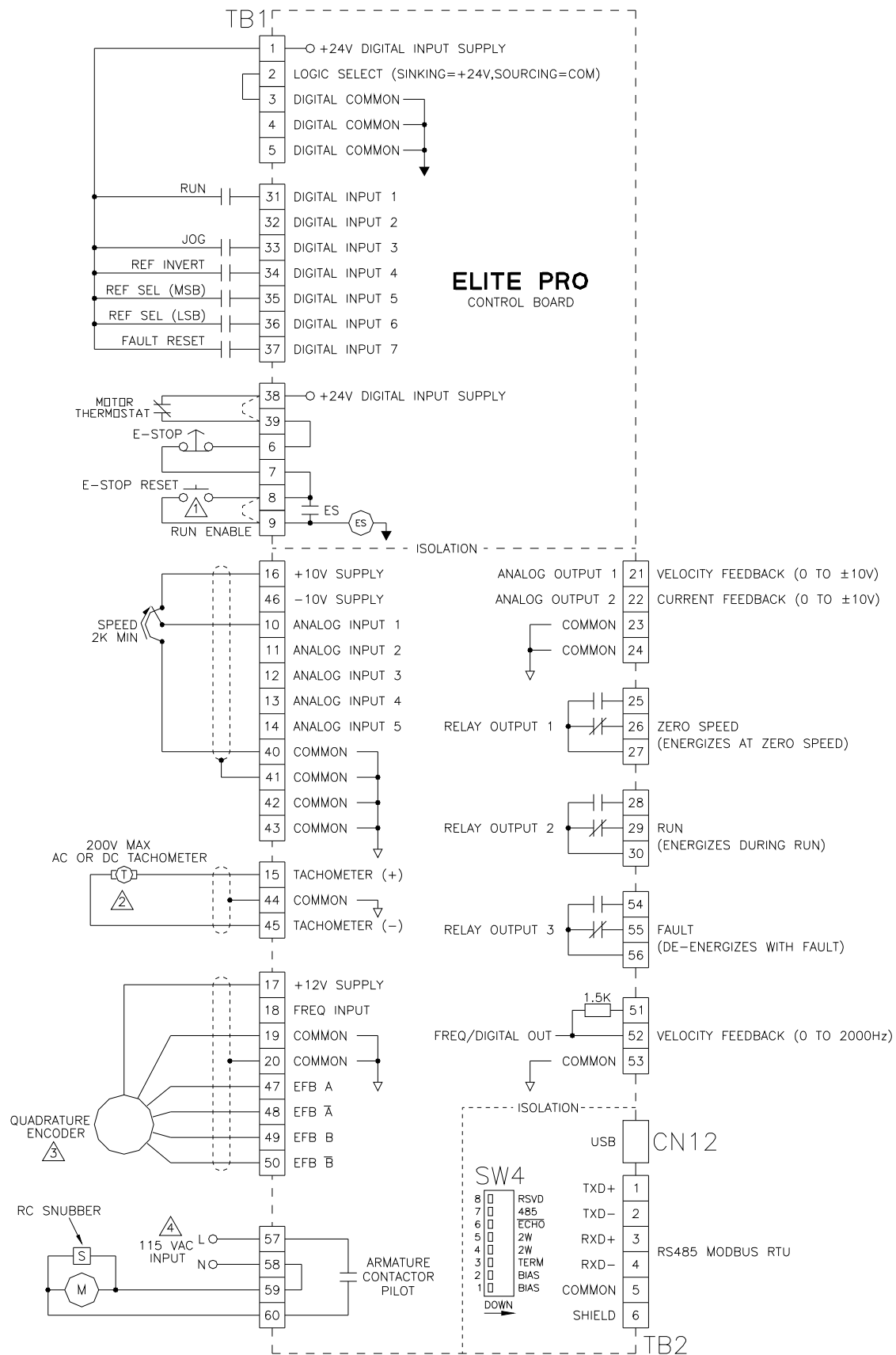
Figure 5

Motor Thermostat

Most motors include "J" or "P" leads that connect to an internal normally closed thermostat. Connecting the thermostat to TB1-38 & 39 as shown in Figure 6 will allow a motor over-temperature condition to shut down the control as in an Emergency Stop condition. If the motor does not provide a thermostat or the thermostat wiring is not used, a jumper must be placed across terminals 38 & 39.

4.3 Signal Connections

Figure 6 shows the typical signal connections to an Elite Pro drive. When operated, the Emergency Stop contacts at terminals 6 and 7 will immediately clamp all control signals. 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 1 for recommended resistor values. If a maintained Emergency Stop push-button is used, the E-Stop Reset contacts at TB1-8 & 9 can be jumpered. Otherwise, a momentary push-button can be used to reset the E-Stop condition.



- ⚠ JUMPER CAN BE SUBSTITUTED FOR ESTOP RESET IF MAINTAINED ESTOP IS USED.
- ⚠ OPTIONAL TACHOMETER FEEDBACK CONNECTIONS SHOWN.
- ⚠ OPTIONAL QUADRATURE ENCODER FEEDBACK CONNECTIONS SHOWN.
- ⚠ 115 VAC SHOWN FOR ARMATURE CONTACTOR COIL. ACTUAL VOLTAGE REQUIRED DEPENDENT UPON ARMATURE CONTACTOR USED.

Figure 6: Signal Connections

The Elite Pro V3 supports three different start/stop logic schemes (four including the local mode). Refer to **Figure 7** below. The momentary scheme (often called 3 wire) uses momentary pushbuttons to control the starting and stopping of the drive. A selector switch or a contact controls the direction. The other two schemes use maintained contacts (often called 2 wire mode). In the Run/Direction scheme, a single contact starts and stops the drive. Another contact selects direction. In the final scheme, each contact starts the drive and selects the direction. Parameter H1.01 needs to be set appropriately.

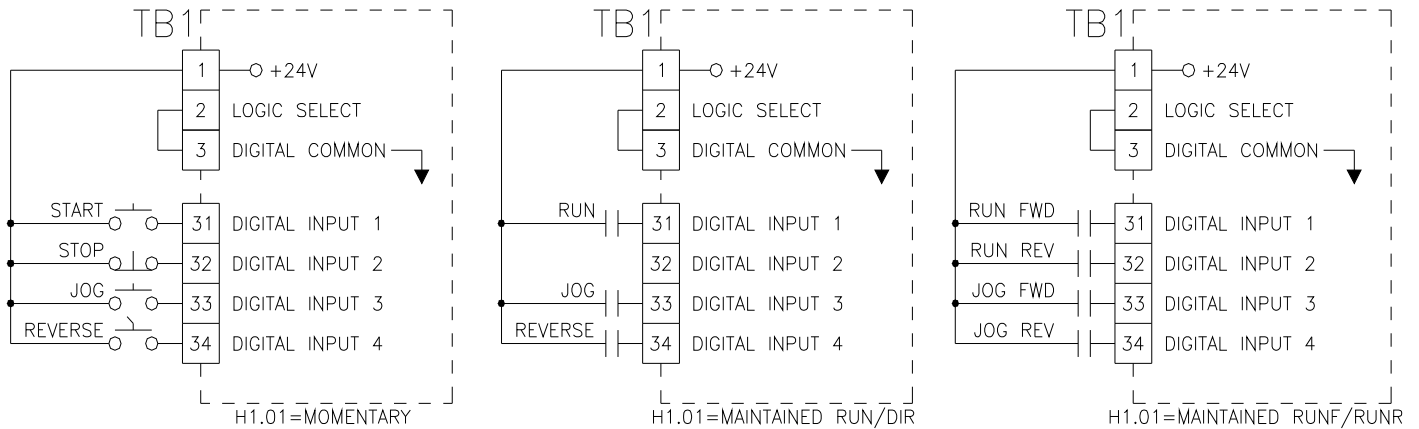


Figure 7

The drive also has the capability to interface with either sinking or sourcing logic controls. Sourcing (PNP) logic is selected by jumpering TB1 terminals 2 & 3. This places an internal pull down resistor on each input. The external switch or sensor must then drive the input high to activate the input. Sinking (NPN) logic is selected by jumpering TB1 terminals 1 & 2. This places an internal pull up resistor on each input. The external switch or sensor must then sink (pull down) the input to common to activate the input.

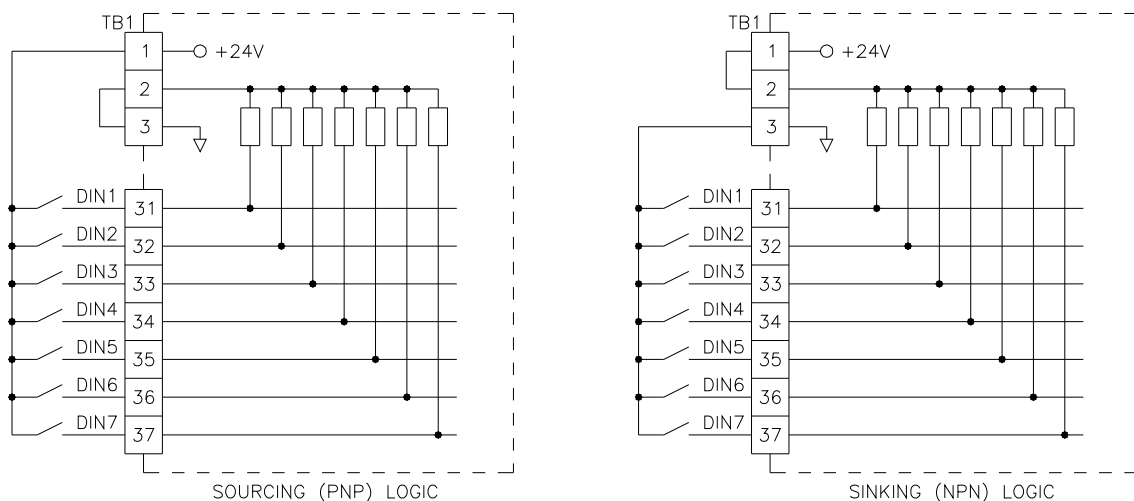


Figure 8

5

Human Machine Interface (HMI)

5.1 Description of Interface

The Human Machine Interface (HMI) is the primary method for accessing the drive's parameters. It allows for custom user configuration, monitoring, and troubleshooting. As seen in Figure 9, the HMI consists of a 4 line by 20 characters display, 11 button keypad, and 4 LEDs.

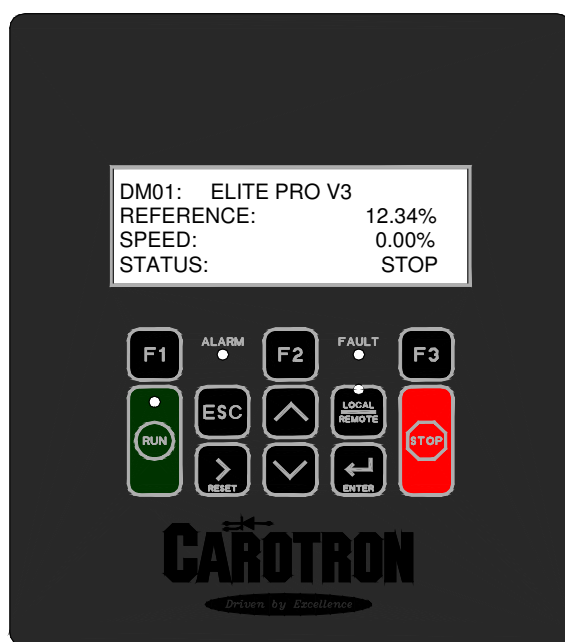


Figure 9

Index	Item	Description
1	F1-F3	Softkeys. The functionality of each of these keys varies depending upon the displayed menu. When utilized, text above the key displays its function.
2	Run Key	Places the drive in run mode when in local mode
3	Stop Key	Stops the drive in all modes
4	Esc Key	<ul style="list-style-type: none"> Returns to the previous menu Moves cursor one place to the left
5	Reset/Right Key	<ul style="list-style-type: none"> Clears drive fault (on a DM screen) Moves cursor one place to the right
6	Local/Remote Key	Switches the drive between local and remote control
7	Enter Key	<ul style="list-style-type: none"> Used to accept/enter parameter values Moves cursor one place to the right
8	Up/Down Keys	<ul style="list-style-type: none"> Scrolls to the next menu display Increments/decrements cursor value
9	Run LED	On: Drive is in run mode and has reference Slow Flash: Drive is in run mode with no reference Fast Flash: Drive is in Safety Mode Off: Drive is not in run mode
10	Local LED	On: Drive is in Local mode Off: Drive is in Remote mode
11	Alarm LED	On: An alarm is present Off: No alarms present
12	Fault LED	On: A fault is present. Fault is not active and can be reset. Flashing: Fault present and currently active. Cannot be reset. Off: No faults present

Table 2: HMI Description

5.2 Menu Structure

When power is applied to the drive, the HMI displays the drive's firmware version. After a short timeout, the Drive Monitor 1 (DM1) screen is displayed. Navigation through the menu is achieved by using the Up, Down, Escape, and Enter keys.

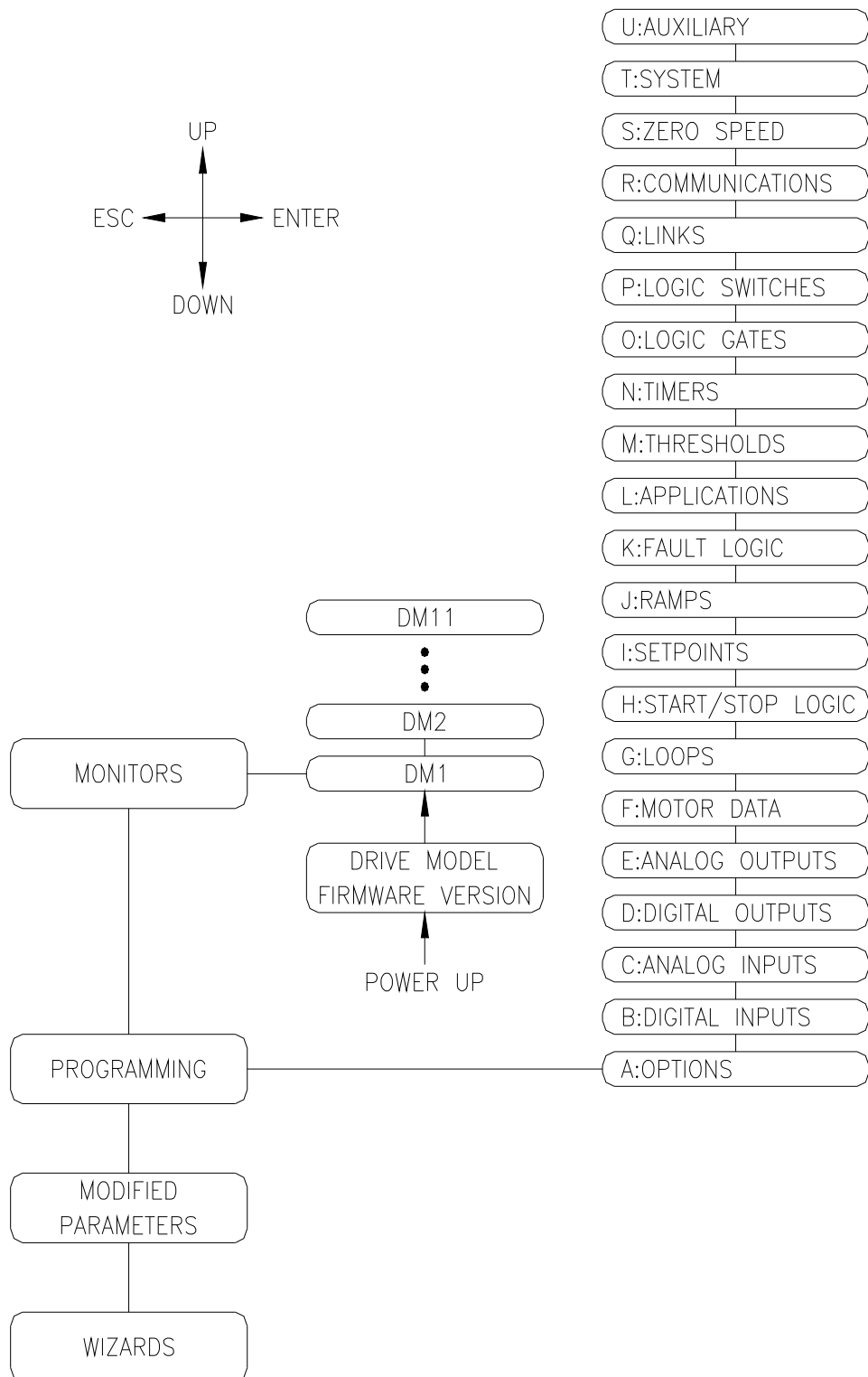


Figure 10

Monitors

The Monitors section contain the Drive Monitor screens. Each of these screens displays various drive status information.

Monitor	Description
DM01	Reference/Speed
DM02	Armature Status
DM03	Field Status
DM04	Fault Status
DM05	Alarm Status
DM06	Velocity Loop Status
DM07	Current Loop Status
DM08	Field Loop Status
DM09	Loop Outputs
DM10	Feedback Status
DM11	Drive Model/Firmware

Table 3: Drive Monitor Descriptions

Programming

The drive parameters are located under the Programming section. Each drive parameter has a unique identifier tag that consists of an alpha group code, and numeric block code, and a two digit numeric index. For example, parameter C2.04 is in Group C, Block 2, and Index 4. When the programming section is first displayed, the first parameter (A1.01) is displayed with the Group Code flashing (i.e. the 'A'). The Up/Down keys are then used to change the Group Code to the desired value. Pressing the Reset/Right key will move the cursor to the right and cause the Block Code to begin flashing. The Up/Down keys are then used to change the Block Code. Pressing the Reset/Right key will move the cursor to the right and cause the Index Code to begin flashing. Again, the Up/Down keys are used to change the Index to display the desired parameter. Pressing Escape will move the cursor left.

In order to simplify the menu, some parameters are hidden when they are not applicable. However, in some cases it may be desired to view these hidden parameters. There are two ways to view these hidden parameters. The first method is to change parameter A1.01 from STANDARD to ADVANCED. This makes all parameters visible. The second method is to use a certain keystroke while scrolling through the parameters. Pressing the F2 key before pressing the Up or Down keys will force the display to show the next/previous parameter (whether it is hidden or not).

Once a parameter is displayed, pressing the Enter key will allow its value to be modified. The current value of the parameter (or a digit in its value) will begin flashing. The Up/Down keys are used to adjust the value. If the parameter is a numeric value, the Reset/Right key can be used to shift the cursor to the right to allow other digits to be adjusted. Pressing the Reset/Right key when the cursor is on the last digit will cause the cursor to be placed on the first digit. Once the desired value is displayed, the value can be entered by pressing the Enter key. The Escape key will exit the parameter adjustment screen without changing the parameter value.

Note: When parameters are altered via the keypad, the changes are saved automatically.

Modified Parameters

This section contains a list of parameters that have been modified from the default factory preset value. The Up/Down keys are used to scroll through the list.

Wizards

This section contains various drive related wizards that aid in drive setup.

6

Start Up Procedure

6.1 Pretest

1. Verify each phase of the 3 phase power supply. Input voltage should be checked ahead of the supplying circuit breaker, disconnect switch, etc. before it is switched on.
2. Connections should be visually inspected and checked for tightness. An ohmmeter can be used to check for ground faults. **Ground faults** in un-isolated circuits of 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 drive's 3 phase input is connected to a grounded "Y" type transformer secondary.
3. Adjust external reference (Analog Input 1) at terminal 10 to 0 volts.
4. Apply single phase control power and three phase bridge power. On initial power up, the drive should display an Invalid Motor Data fault. Press CLOSE to exit. When asked to run the Basic Setup Wizard, select YES. If the wizard was cancelled, it can be re-started from the Wizards section in the menu.

6.2 Adjustment Procedure: Velocity (Speed) Regulator

1. Presets

Use the Basic Setup Wizard to set the required parameters. The wizard will step you through various drive parameters. When a parameter is displayed, press the ENT key to edit its value. There are a number of required parameters. The wizard will not allow you to proceed until a valid value has been entered. It is recommended that the drive initially be setup using armature feedback even if a tachometer or encoder will be used. This allows the proper feedback signal to be verified before using it for control. After the motor data is entered in the wizard, the drive should begin producing field output. Depending upon the wizard data entered, you may have the option to operate the field in either open or closed loop mode. After the field mode is selected, the wizard will display a field status screen showing the field voltage and field current. Verify the displayed values correspond to the motor nameplate. In many cases, when a motor is cold and the nameplate field voltage is applied, the field current will be much higher than its rated nameplate value. As the motor warms up, the field winding resistance should increase, which will cause the field current to decrease. If open loop was selected and the field output requires additional adjustment, press the ENT key while the status screen is displayed. This allows adjustment of **Open Loop Reference (G3.03)**. Regardless of the mode, please ensure the field levels are correct before proceeding.
2. Clear any Faults

When the wizard is completed, the drive will try to clear any faults that are present. If a fault is still present (i.e. the Fault LED is on or flashing), navigate to the DM04 screen to display the current fault. Once the fault condition is removed, the fault can be cleared by pressing the RESET key while on any DM screen.
3. Validate E-STOP

When an E-STOP is activated, the status display on the DM01 screen should display E-STOP. When the E-STOP is cleared, the status should display STOP or FAULT. If E-STOP is always displayed, not all interlocks have been made. Please refer to the wiring diagram in Figure 6 on page 12. The 24V from terminal 38 should flow through all the interlocks to terminal 9. Do not proceed until the E-STOP functions properly.
4. Safety Check

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.

5. Check Motor Rotation

While displaying the DM01 screen, place the drive in local mode by pressing the LOCAL/REMOTE key. The Local LED should be on. Press and hold the F1 key to jog the drive. The armature contactor should close and the motor should rotate slowly. Observe the direction of rotation. Release F1 to stop the drive. If the motor rotation is reversed, remove all power and reverse the motor armature or field wires. If used, observe proper polarization of the series field winding per the instructions in Section 4.2. After re-applying power, repeat this step to verify motor direction.

6. Validate External Start/Stop

Press the LOCAL/REMOTE key to return the drive to Remote mode. The Local mode LED should be off. Adjust the external reference signal connected to terminal 10 to its minimum. Typically, the reference value on DM01 should be approximately zero. Place the drive in Run mode via the external contacts. Slowly increase the external reference until the motor is rotating. Issue a stop command using the external contacts and verify the motor stops and the contactor de-energizes.

7. Validate Reverse Direction (optional, EP4 regenerative unit required)

With reference at minimum, run the drive in the reverse direction. Slowly increase the reference and verify motor runs in reverse direction. Stop drive.

8. Validate Tachometer Feedback (required only if a motor mounted tachometer is used)

Proper tachometer operation should be checked while the drive is running in Armature Feedback. Place the drive in run mode and run at a low speed (approximately 20%). On the display, navigate to DM10. Compare Armature feedback to Tachometer feedback. The values should be approximately equal (within 5%). If the values have approximately the same value but the wrong polarity, press the Stop button and invert the tachometer feedback by setting parameter **F2.02** to On. Place the drive back in the run mode and re-check. If the values are not equal, verify the tachometer data is entered properly in section F2 (or the wizard) and jumpers J1-J3 are set properly. Once corrected and the values are equal at low speeds, increase speed and check at higher speeds. If the values are approximately equal throughout the speed range, the drive can be placed in the tachometer feedback. With the drive in the stop mode, set parameter **G2.15** to Tachometer. Run drive and verify proper operation.

9. Validate Encoder Feedback (required only if a motor mounted encoder is used)

Proper encoder operation should be checked while the drive is running in Armature Feedback. Place the drive in run mode and run at a low speed (approximately 20%). On the display, navigate to DM10. Compare Armature feedback to Encoder feedback. The values should be approximately equal (within 5%). If the values have approximately the same value but the wrong polarity, press the Stop button and invert the encoder feedback by setting parameter **F3.03** to On. Place the drive back in the run mode and re-check. If the values are not equal, verify the encoder data is entered properly in section F2 (or the wizard). Once corrected and the values are equal at low speeds, increase speed and check at higher speeds. If the values are approximately equal throughout the speed range, the drive can be placed in the encoder feedback. With the drive in the stop mode, set parameter **G2.15** to Encoder. Run drive and verify proper operation.

6.3 Adjustment Procedure: Constant Horsepower

1. Presets

Set up the Elite Pro V3 drive as a normal velocity regulator to run at the motor's base speed using tachometer or encoder feedback with closed loop field control. Refer to Section 6.2 above. Once correct operation in this mode has been achieved, proceed with the following steps.

2. Parameters

Re-run the Basic Setup Wizard and set the Operating Mode to CONST HP (CROSSOVER). Continue through the wizard and enter additional motor data (specifically the extended speed field amps, and extended speed value). If tachometer is used, re-scale Jumpers J1-J3 as instructed by the wizard.

3. Test

With reference at minimum, place drive in run mode. Navigate to DM03 and verify the motor field current is at the base speed level. Navigate to DM02 to display the armature voltage. Slowly increase reference until armature voltage is approximately 85% of the nameplate value (204V for 240V armatures, or 425V for 500V armatures). Return to DM03 and monitor the motor field current, while increasing the speed reference. The field current should begin decreasing as the speed reference is increased. When the maximum reference is applied, the field current should be approximately at the extended speed field current level. Return to DM02 and verify armature voltage is at the motor's rated armature voltage level.

6.4 Adjustment Procedure: Torque (Current) Regulator

1. Presets

Set up the Elite Pro V3 drive as a normal velocity regulator to run at the motor's base speed using armature feedback. Refer to Section 6.2. Once correct operation in this mode has been achieved, proceed with the following steps.

2. Parameters

Re-run the Basic Setup Wizard and set the Operating Mode to TORQUE. Continue through the wizard and enter any required data.

3. Test

With reference at minimum, place drive in run mode. Navigate to DM02 to display the armature current. Slowly increase reference and verify control of armature current.

6.5 Calibration & Fine Tuning

1. If the drive is using armature feedback (i.e. G2.15 is set to ARMATURE), then **IR Compensation (G2.09)** can be adjusted to improve the speed regulation with load changes. Adjustment is best done when the motor or machine can be loaded normally. If the motor is normally operated at a particular speed, adjust **IR Compensation (G2.09)** 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 using a hand tachometer or other speed measuring device. 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 **IR Compensation (G2.09)** 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 armature voltage feedback (AFB) to measure speed. Armature voltage is not an exact indication of loaded motor speed!

2. The **Current Proportional Gain (G1.16)**, **Current Integral Time (G1.17)**, **Velocity Proportional Gain (G2.21)**, and **Velocity Integral Time (G2.22)** parameters are preset by Carotron to provide stable and responsive performance under most load conditions. When required, the drive performance can be optimized for a particular application or to correct undesirable operation by use of these adjustments. The adjustments are complex though and can adversely affect operation if not properly set. In general, the settings that give the most stable operation do not always give the fastest response.

Current Loop

The current loop can be manually tuned by directly applying a stepped reference and monitoring the current feedback. In order to adjust properly, connect an oscilloscope between common and the A.IFB testpoint on the control board. The rotor shaft must not rotate during this procedure. Therefore, set **Field Enable (G3.01)** to DISABLE to remove voltage from the shunt field. Set **Reference Select (G1.01)** to STEP. Set the **Step Reference (G1.23)** initially to a low value (around 20%). Set the **Step Duration (G1.24)** to 500ms. Place the drive in the run mode. Set **Step Enable (G1.25)** to ENABLE to apply a step change to the PI loop. The current feedback signal should respond quickly with minimum overshoot. Adjust the **Current Proportional Gain (G1.16)** and **Current Integral Time (G1.17)** parameters and re-apply the Step Enable until a critically damped waveform as seen in Figure 11. Increasing the proportional gain improves the response but increases the overshoot. Reducing the integral time improves the response but can cause instability if set too low. Once a critically damped waveform is obtained, increase the Step Reference to 40% and repeat above. Continue until a Step Reference of 100% is achieved. Return **Field Enable (G3.01)** to ENABLE and **Reference Select (G1.01)** to NORMAL when complete.

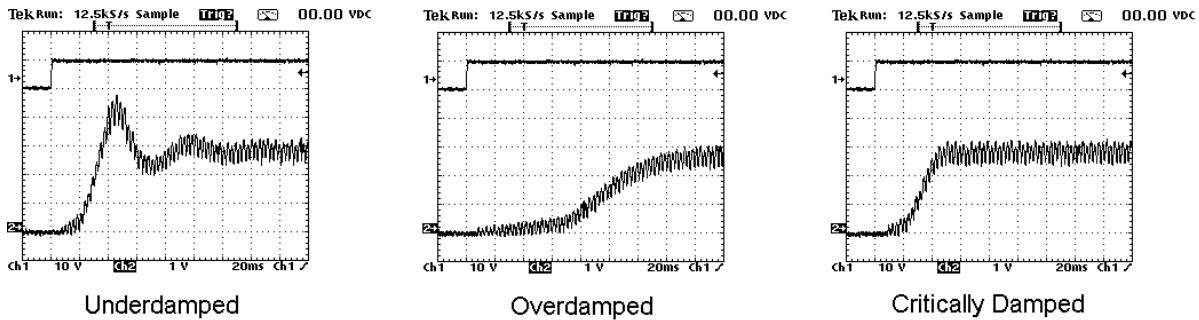


Figure 11

Velocity Loop

In order to adjust properly, connect an oscilloscope to Analog Output 1 Terminal 21 (Velocity Feedback). Using the HMI, temporarily set the **Reference Select (G2.31)** to STEP. Set Step Reference (G2.32) to 20% and Step Duration (G2.33) initially to 2 seconds. Place the drive in the run mode and apply a step change by setting Step Enable (G2.34) to ENABLE. Observe the response of the drive on the oscilloscope. The motor speed should respond quickly with minimum overshoot. Adjust the **Velocity Proportional Gain (G2.21)** and **Velocity Integral Time (G2.22)** parameters to obtain a critically damped waveform as seen in Figure 12. Increasing the proportional gain improves the response but increases the overshoot. Reducing the integral time improves the response but can cause instability if set too low. Repeat above in steps gradually increasing the Step Reference to 100% (or the max required speed is obtained). Once complete, return **Reference Select (G2.31)** to NORMAL.

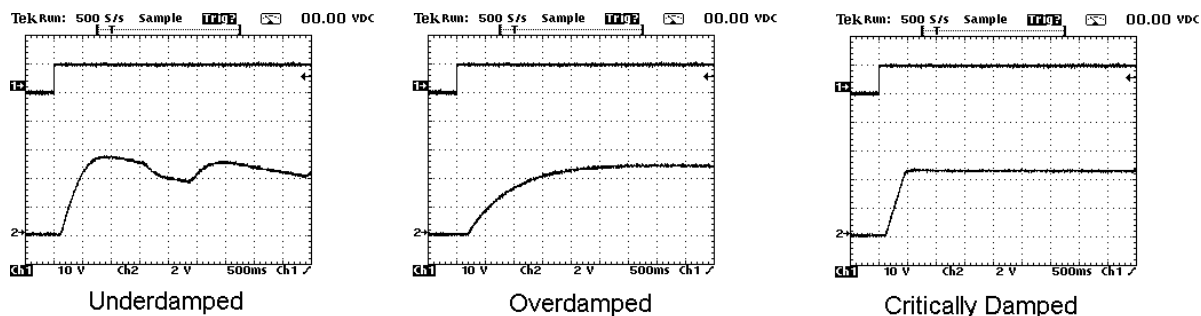


Figure 12

6.4 Password Protection

If password protection is required, set the appropriate password under A1.04. Please note that this is a special hidden parameter. You must first display A1.03. Then press F2 key and then the Up key to display A1.04. Once A1.04 has a value other than zero, parameters can be viewed but cannot be changed. Changes can only be made by first entering the password into parameter A1.05. Once all changes have been made, A1.05 can be manually returned to 0 to logout. The drive also has a timeout feature, that automatically clears the entered password in A1.05 after 5 minutes.

7

Programming & Adjustments

Programming and adjustment of the Elite Pro is accomplished by changing parameter settings. Each parameter has a Tag identifier and a descriptive name. Parameters are separated into groups and blocks according to their function. The following sections contain each software block diagram and descriptions of each parameter function. Refer to Figure 13 for key conventions that are used in the block diagrams. Each parameter is one of three types: Read-Write (RW), Inhibit Change while Running (ICR), or Read-Only (RO). ICR parameters can be changed only when the drive is not running.

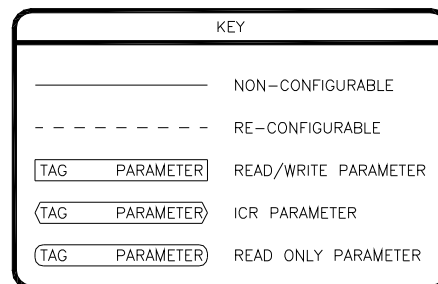


Figure 13

7.1 A: Options

These parameters set the drive's basic operating mode.

A1: Options

A1.01 Parameter Visibility (R/W, Preset: Standard)

When set to **Standard**, parameters that are typically not relevant to the current operating mode are hidden.

When set to **Advanced**, all parameters are visible.

A1.02 Operating Mode (ICR, Preset: Velocity)

Sets the drive's operating mode.

VELOCITY

Drive regulates motor speed.

CONST HP (CROSSOVER)

Drives regulates speed utilizing the motor's extended speed range. Also known as field weakening or field crossover.

TORQUE

Drive regulates motor torque (or armature current).

A1.03 Initialize (ICR, Preset: 0)

9999: Re-initializes the drive and returns all parameters to the factory default setting.

Range: 0..65535

A1.04 Define Password (R/W, Preset: 0)

A numeric password may be set to prevent unauthorized parameter changes. After a numeric password has been entered, the drive allows all parameters to be viewed, but prevents changes from being made. Only after a valid password has been entered into A1.05 can changes be made. This parameter requires a special keystroke to display. With A1.03 displayed, press F2 and then UP. Range: 0..65535

A1.05 Enter Password (R/W, Preset: 0)

If a numeric password has been defined in parameter A1.04, the same password must be entered into parameter A1.05 before any parameter changes can be made. As a security feature, the drive automatically clears the entered password after 5 minutes. Parameter A1.05 is typically only visible after a password is defined in parameter A1.04. Range: 0..65535

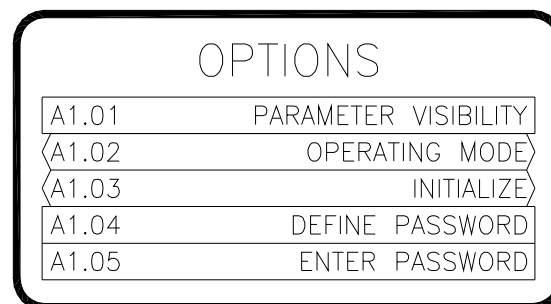


Figure 14

7.2 B: Digital Inputs

These parameters configure the drive's physical digital inputs (digital & frequency).

B1: Digital Input 1

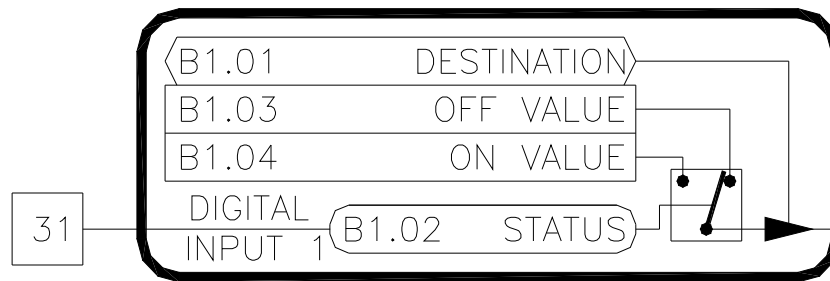


Figure 15

B1.01 Digital Input 1 Destination (ICR, Preset: H1.02 [Run])

Determines the function of the digital input. Each digital input can control (or write to) any R/W parameter in the drive. The destination parameter contains the tag of the parameter the input will control (i.e. the target parameter). Refer to Table 4 for a list of commonly used functions.

Value	Function
H1.02	Start-Run-Run Fwd*
H1.03	/Stop-Run Rev*
H1.04	Jog-Jog Fwd*
H1.05	Rev-Jog Rev*
H1.08	/Coast Stop
H1.09	/Quick Stop
H1.10	/Dynamic Brake Stop
I1.01	Aux Reference Enable
I1.02	Ref Select (MSB)
I1.03	Ref Select (LSB)
J1.18	Ramp 1 Bypass
K1.14	External Fault
K1.15	Fault Reset
L1.01	PID Enable
L1.02	PID Reset
L6.01	MOP Increase
L6.02	MOP Decrease
L6.07	MOP Reset

Table 4: Common Digital Input Functions

*The actual function is determined by the H1.01 setting.

B1.02 Digital Input 1 Status [Terminal 31] (RO)

Displays the status of the digital input. A value of **OFF** indicates the digital input is off or not activated. A value of **ON** indicates the digital input is on or active.

B1.03 Digital Input 1 Off Value (RW)

This is the value written to the target parameter when the digital input's status is **OFF**. The limits and units of these parameters will change to match the limits and units of the target parameter.

B1.04 Digital Input 1 On Value (RW)

This is the value written to the target parameter when the digital input's status is **ON**. The limits and units of these parameters will change to match the limits and units of the target parameter.

B2: Digital Input 2

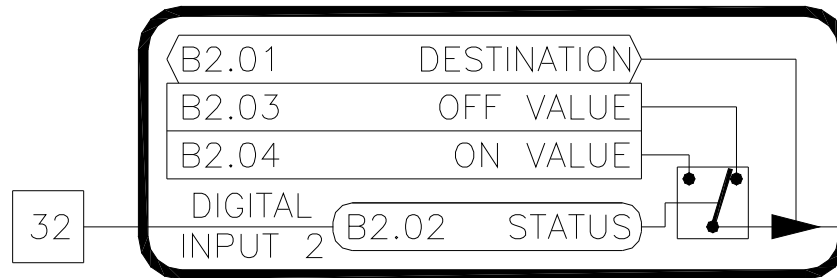


Figure 16

B2.01 Digital Input 2 Destination (ICR, Preset: H1.03 [/Stop])

B2.02 Digital Input 2 Status [Terminal 32] (RO)

B2.03 Digital Input 2 Off Value (RW)

B2.04 Digital Input 2 On Value (RW)

Digital Input 2 is functionally equivalent to Digital Input 1. Refer to B1.XX

B3: Digital Input 3

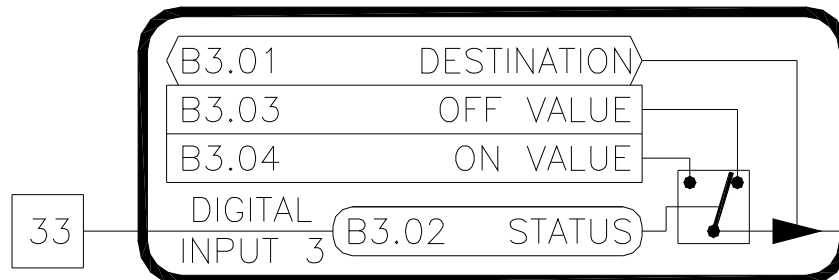


Figure 17

B3.01 Digital Input 3 Destination (ICR, Preset: H1.04 [Jog])

B3.02 Digital Input 3 Status [Terminal 33] (RO)

B3.03 Digital Input 3 Off Value (RW)

B3.04 Digital Input 3 On Value (RW)

Digital Input 3 is functionally equivalent to Digital Input 1. Refer to B1.XX

B4: Digital Input 4

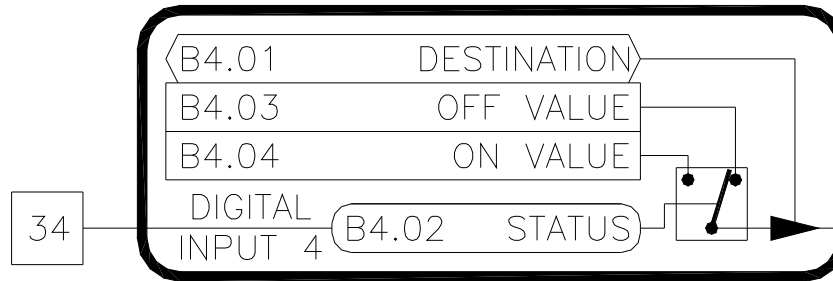


Figure 18

B4.01 Digital Input 4 Destination (ICR, Preset: H1.05 [Reverse])

B4.02 Digital Input 4 Status [Terminal 34] (RO)

B4.03 Digital Input 4 Off Value (RW)

B4.04 Digital Input 4 On Value (RW)

Digital Input 4 is functionally equivalent to Digital Input 1. Refer to B1.XX

B5: Digital Input 5

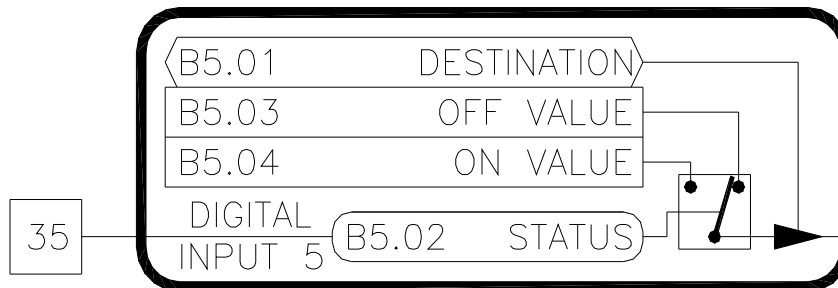


Figure 19

B5.01 Digital Input 5 Destination (ICR, Preset: I1.02 [RefSelMsb])

B5.02 Digital Input 5 Status [Terminal 35] (RO)

B5.03 Digital Input 5 Off Value (RW)

B5.04 Digital Input 5 On Value (RW)

Digital Input 5 is functionally equivalent to Digital Input 1. Refer to B1.XX

B6: Digital Input 6

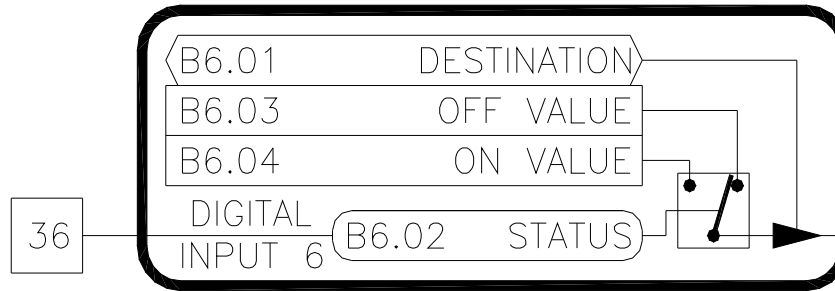


Figure 20

B6.01 Digital Input 6 Destination (ICR, Preset: I1.03 [RefSelLsb])

B6.02 Digital Input 6 Status [Terminal 36] (RO)

B6.03 Digital Input 6 Off Value (RW)

B6.04 Digital Input 6 On Value (RW)

Digital Input 6 is functionally equivalent to Digital Input 1. Refer to B1.XX

B7: Digital Input 7

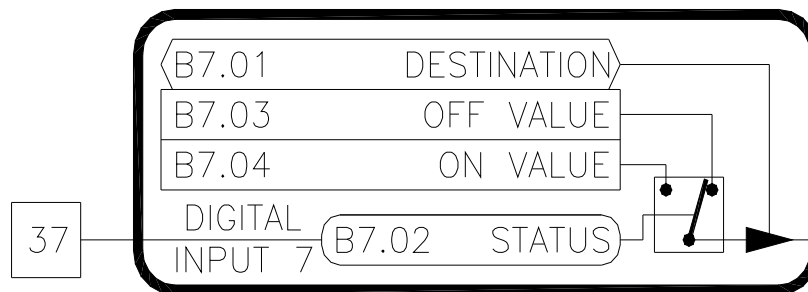


Figure 21

B7.01 Digital Input 7 Destination (ICR, Preset: K1.15 [ExtFaultReset])

B7.02 Digital Input 7 Status [Terminal 37] (RO)

B7.03 Digital Input 7 Off Value (RW)

B7.04 Digital Input 7 On Value (RW)

Digital Input 7 is functionally equivalent to Digital Input 1. Refer to B1.XX

B8: Frequency Input

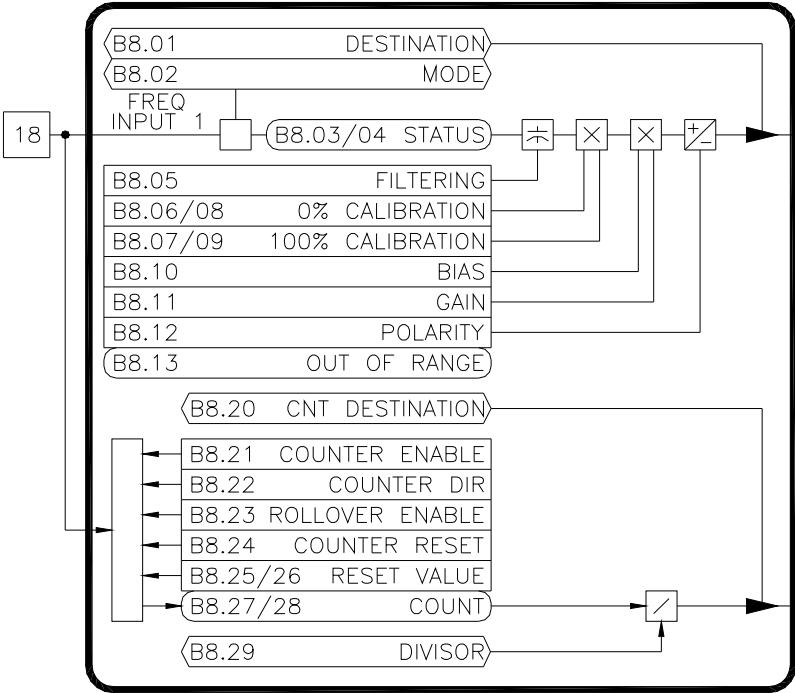


Figure 22

B8.01 Freq Input Destination (ICR, Preset: 00.00 [Not Set])

The frequency input can control (or write to) any R/W parameter in the drive. The destination parameter contains the tag of the parameter the input will control (i.e. the target parameter). Refer to Table 5 on page 29 for a list of commonly used functions.

B8.02 Freq Input Mode (ICR, Preset: Freq Input)

The frequency input can operate in either the **FREQ INPUT** or **SONIC INPUT** modes. In the frequency input mode, the input level is determined by the input frequency. The sonic mode is used in conjunction with Carotron's sonic transducer (P/N: C10757-000 or C11307-000) to measure distance.

B8.03 Freq Input Status (RO)

Valid only when B8.02 equals **FREQ INPUT**. Displays the frequency input level at terminal 18 in Hertz.

B8.04 Freq Input Status (RO)

Valid only when B8.02 equals **SONIC INPUT**. Displays the measured distance of the sonic transducer connected to terminal 18 in inches.

B8.05 Freq Input Filtering (R/W, Preset: 0)

Sets the level of digital filtering applied to the input signal. The adjustment ranges from 0 (no filtering) to 15 (heavily filtered).

B8.06 Freq Input 0% Calibration (R/W, Preset: 0Hz)

Defines the minimum input frequency in Hertz. An input value below this level will be ignored. This parameter is only used when in the **FREQ INPUT** mode. Range: 0..50,000Hz

B8.07 Freq Input 100% Calibration (R/W, Preset: 50000Hz)

MAX FREQ Defines the maximum input frequency in Hertz. An input value above this level will be ignored. This parameter is only used when in the **FREQ INPUT** mode. Range: 0..50,000Hz

B8.08 Freq Input 0% Calibration (R/W, Preset: 6.00")

Defines the minimum input distance in inches. An input value below this level will be ignored. This parameter is only used when in the **SONIC INPUT** mode. Range: 0..420"

B8.09 Freq Input 100% Calibration (R/W, Preset: 420.00")

Defines the maximum input distance in inches. An input value above this level will be ignored. This parameter is only used when in the **SONIC INPUT** mode. Range: 0..420"

B8.10 Freq Input Bias (R/W, Preset: 0.00)

Defines the value of the target parameter when the input signal is less than or equal to the 0% Calibration. Note that the formatting of this parameter will change to match that of the target parameter. For example, if the target parameter is in percent, this parameter will be in percent. If the target parameter is True/False, this parameter will be True/False.

B8.11 Freq Input Gain (R/W, Preset: 100.00)

Defines the value of the target parameter when the input signal is greater than or equal to the 100% Calibration. Note that the formatting of this parameter will change to match that of the target parameter.

B8.12 Freq Input Polarity (R/W, Preset: Positive)

Defines the polarity of the target parameter. When set to **POSITIVE**, the target parameter will have a positive value. Likewise, when set to **NEGATIVE**, the target parameter will be negative.

B8.13 Out of Range (RO)

Displays the status of the sonic transducer distance measurement. If B8.04 is 10% less than B8.08 or B8.04 is 10% greater than B8.09, this parameter will be TRUE indicating the target is out of range.

B8.20 Counter Destination (ICR, Preset: 00.00 [Not Set])

The drive has a counter associated with the frequency input. This count value can control (or write to) any R/W parameter in the drive. The destination parameter contains the tag of the parameter the input will control (i.e. the target parameter).

B8.21 Counter Enable (R/W, Preset: Disabled)

The counter is enabled when set to **ENABLED**.

B8.22 Counter Direction (R/W, Preset: Up)

Controls the direction of the counter. When set to **UP**, each pulse on the input will cause the counter (B8.26/27) to increase. When set to **DOWN**, each pulse on the input will cause the counter to decrease.

B8.23 Rollover Enable (R/W, Preset: Disabled)

When **ENABLED**, the counter is allowed to rollover from maximum to minimum when counting up, or to rollover from minimum to maximum when counting down. If **DISABLED**, rollover is not allowed and the count value will stop and hold its value at the maximum or minimum.

B8.24 Counter Reset (R/W, Preset: Off)

Resets the counter (B8.26/27) to the Reset Value (B8.24/25) when **ON**.

B8.25 Reset Value Lo (R/W, Preset: 0)**B8.26 Reset Value Hi (R/W, Preset: 0)**

The 32 bit counter will be preset to the value in these two registers when B8.23 is **ON**.

B8.27 Counter Lo (RO)**B8.28 Counter Hi (RO)**

The 32 bit counter is split into two 16 bit sections (B8.28:B8.27). The counter has a maximum value of 4,294,967,295.

B8.29 Divisor (ICR, Preset: 1)

The 32 bit count value is divided by this value before being written to the target parameter. Range: 0..65535

7.3 C: Analog Inputs

These parameters configure the drive's physical analog inputs.

C1: Analog Input 1

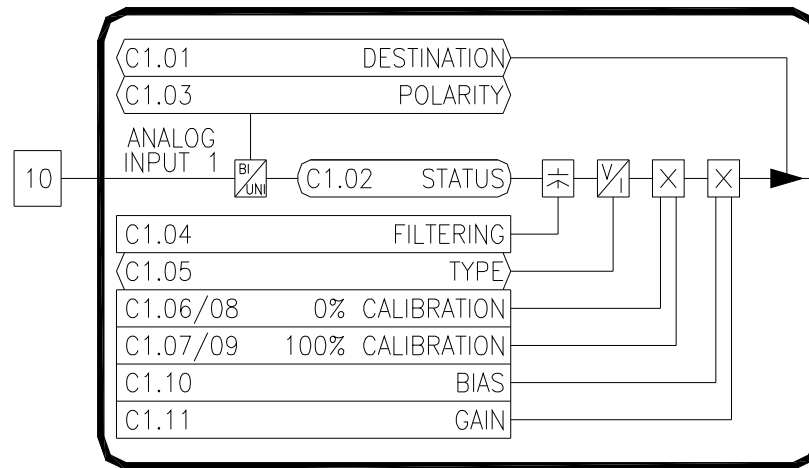


Figure 23

C1.01 Analog Input 1 Destination (ICR, Preset: I1.04 [Reference A])

Each of the analog inputs can control (or write to) any R/W parameter in the drive. The destination parameter contains the tag of the parameter the input will control (i.e. the target parameter). Refer to Table 5 for a list of commonly used functions.

Value	Function
G1.05	POSITIVE CURRENT LIMIT
G1.06	NEGATIVE CURRENT LIMIT
I1.04	REF A
I1.05	REF B
I1.06	REF C
I1.07	REF D
I1.08	JOG REF
I2.02	SETPOINT B
I2.04	SETPOINT C
I2.06	SETPOINT D
L1.13	AUX PID SETPOINT
L1.14	AUX PID FEEDBACK
L1.23	AUX PID SCALE
L2.07	DIA CALC: EXT DIA RATIO
L4.01	TENSION CALC: TENSION SET

Table 5: Common Analog & Freq Input Functions

C1.02 Analog Input 1 Status (RO)

Displays the raw analog to digital conversion value. Table 6 below lists the typical status values for common input levels.

Signal Input		Status	
Voltage	Current	Unipolar	Bipolar
+10V	-	4095	2047
+7.5V	-	3070	1535
+5V	20mA	2047	1023
+2.5V	10mA	1023	511
0V	0mA	0	0
-2.5V	-10mA	-	-512
-5V	-20mA	-	-1024
-7.5V	-	-	-1536
-10V	-	-	-2048

Table 6: Analog Input Status Readings

C1.03 Analog Input 1 Polarity (ICR, Preset: Unipolar)

Configures the type of analog input signal used, either **UNIPOLAR** or **BIPOLAR**.

C1.04 Analog Input 1 Filtering (R/W, Preset: 0)

Sets the level of digital filtering applied to the input signal. The adjustment ranges from 0 (no filtering) to 15 (heavily filtered). Range: 0..15

C1.05 Analog Input 1 Type (ICR, Preset: Voltage)

Configures the type of analog input signal used, either **VOLTAGE** or **CURRENT**.

C1.06 Analog Input 1 Unipolar 0% Calibration (R/W, Preset: 0)

Defines the minimum signal level in **UNIPOLAR** mode. An input value below this level will be ignored. Refer to Figure 24. Range: 0..4095

C1.07 Analog Input 1 Unipolar 100% Calibration (R/W, Preset: 4095)

Defines the maximum raw signal level in **UNIPOLAR** mode. An input value above this level will be ignored. Refer to Figure 24. Range: 0..4095

C1.09 Analog Input 1 Bipolar 100% Calibration (R/W, Preset: 2047)

Defines the maximum raw positive and negative signal levels in **BIPOLAR** mode. Any input value exceeding this level will be ignored. Refer to Figure 24. Range: 0..2047

C1.10 Analog Input 1 Bias (R/W, Preset: 0.00)

Defines the value of the target parameter when the input signal is less than or equal to the 0% Calibration. Refer to Figure 24. Note that the formatting of this parameter will change to match that of the target parameter. For example, if the target parameter is percent, this parameter will be percent. If the target parameter is Seconds, this parameter will be Seconds.

C1.11 Analog Input 1 Gain (R/W, Preset: 100.00)

Defines the value of the target parameter when the input signal is greater than or equal to the 100% Calibration. Refer to Figure 24. Note that the formatting of this parameter will change to match that of the target parameter.

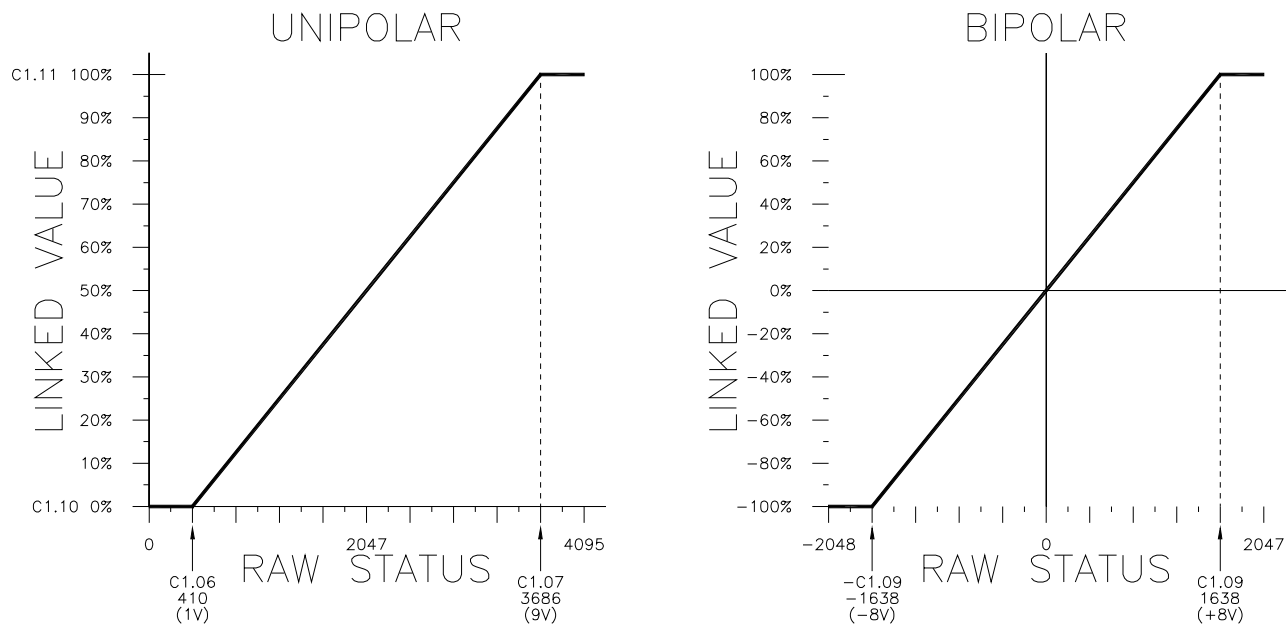


Figure 24

C2: Analog Input 2

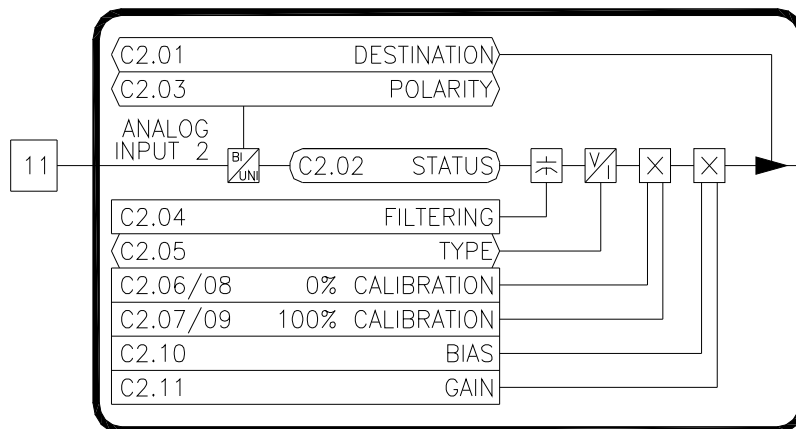


Figure 25

C2.01 Analog Input 2 Destination (ICR, Preset: 00.00 [Not Set])

C2.02 Analog Input 2 Status (RO)

C2.03 Analog Input 2 Polarity (ICR, Preset: Unipolar)

C2.04 Analog Input 2 Filtering (R/W, Preset: 0)

C2.05 Analog Input 2 Type (ICR, Preset: Voltage)

C2.06 Analog Input 2 0% Calibration (R/W, Preset: 0)

C2.07 Analog Input 2 100% Calibration (R/W, Preset: 4095)

C2.08 Analog Input 2 0% Calibration (R/W, Preset: 0)

C2.09 Analog Input 2 100% Calibration (R/W, Preset: 2047)

C2.10 Analog Input 2 Bias (R/W, Preset: 0.00)

C2.11 Analog Input 2 Gain (R/W, Preset: 100.00)

Analog Input 2 is functionally equivalent to Analog Input 1. Refer to C1.XX.

C3: Analog Input 3

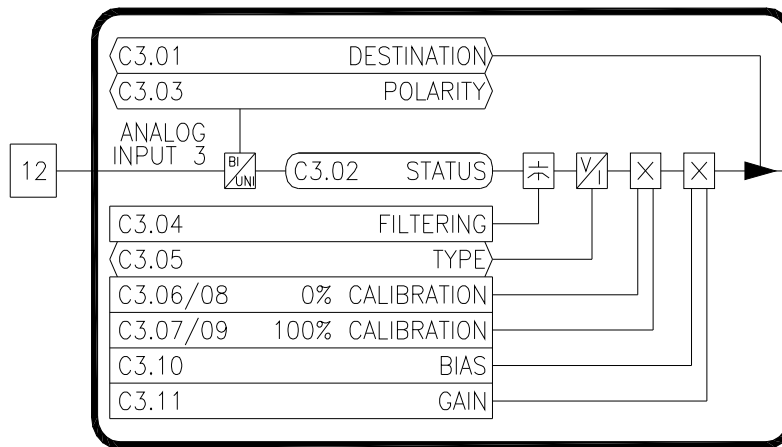


Figure 26

C3.01 Analog Input 3 Destination (ICR, Preset: 00.00 [Not Set])

C3.02 Analog Input 3 Status (RO)

C3.03 Analog Input 3 Polarity (ICR, Preset: Unipolar)

C3.04 Analog Input 3 Filtering (R/W, Preset: 0)

C3.05 Analog Input 3 Type (ICR, Preset: Voltage)

C3.06 Analog Input 3 0% Calibration (R/W, Preset: 0)

C3.07 Analog Input 3 100% Calibration (R/W, Preset: 4095)

C3.08 Analog Input 3 0% Calibration (R/W, Preset: 0)

C3.09 Analog Input 3 100% Calibration (R/W, Preset: 2047)

C3.10 Analog Input 3 Bias (R/W, Preset: 0.00)

C3.11 Analog Input 3 Gain (R/W, Preset: 100.00)

Analog Input 3 is functionally equivalent to Analog Input 1. Refer to C1.XX.

C4: Analog Input 4

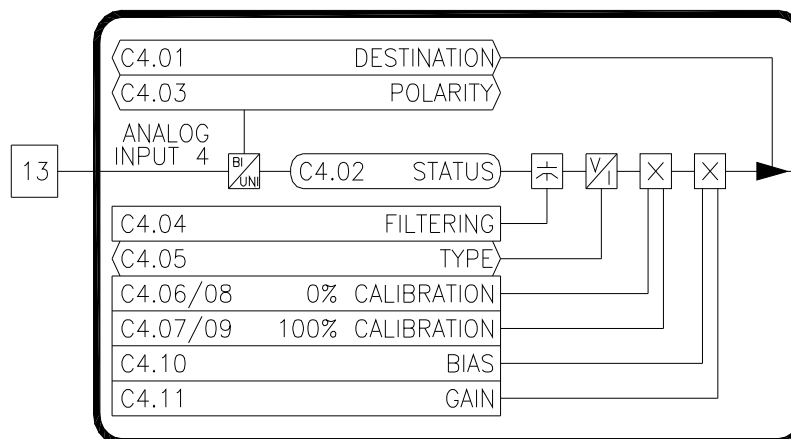


Figure 27

C4.01 Analog Input 4 Destination (ICR, Preset: 00.00 [Not Set])

C4.02 Analog Input 4 Status (RO)

C4.03 Analog Input 4 Polarity (ICR, Preset: Unipolar)

C4.04 Analog Input 4 Filtering (R/W, Preset: 0)

C4.05 Analog Input 4 Type (ICR, Preset: Voltage)

C4.06 Analog Input 4 0% Calibration (R/W, Preset: 0)

C4.07 Analog Input 4 100% Calibration (R/W, Preset: 4095)

C4.08 Analog Input 4 0% Calibration (R/W, Preset: 0)

C4.09 Analog Input 4 100% Calibration (R/W, Preset: 2047)

C4.10 Analog Input 4 Bias (R/W, Preset: 0.00)

C4.11 Analog Input 4 Gain (R/W, Preset: 100.00)

Analog Input 4 is functionally equivalent to Analog Input 1. Refer to C1.XX.

C5: Analog Input 5

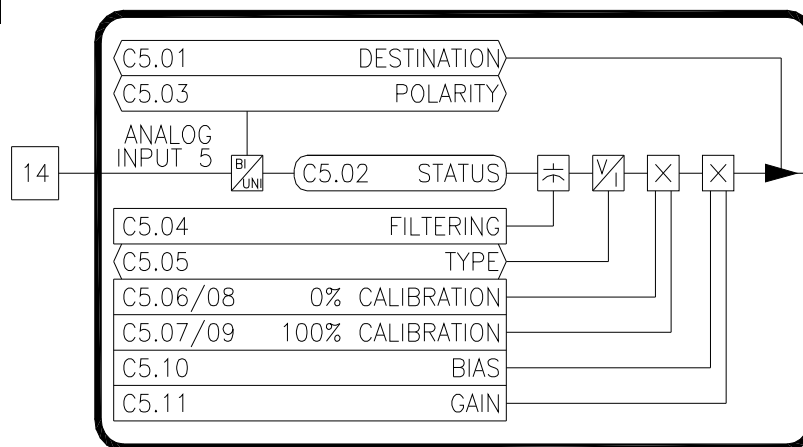


Figure 28

C5.01 Analog Input 5 Destination (ICR, Preset: 00.00 [Not Set])

C5.02 Analog Input 5 Status (RO)

C5.03 Analog Input 5 Polarity (ICR, Preset: Unipolar)

C5.04 Analog Input 5 Filtering (R/W, Preset: 0)

C5.05 Analog Input 5 Type (ICR, Preset: Voltage)

C5.06 Analog Input 5 0% Calibration (R/W, Preset: 0)

C5.07 Analog Input 5 100% Calibration (R/W, Preset: 4095)

C5.08 Analog Input 5 0% Calibration (R/W, Preset: 0)

C5.09 Analog Input 5 100% Calibration (R/W, Preset: 2047)

C5.10 Analog Input 5 Bias (R/W, Preset: 0.00)

C5.11 Analog Input 5 Gain (R/W, Preset: 100.00)

Analog Input 5 is functionally equivalent to Analog Input 1. Refer to C1.XX.

7.4 D: Digital Outputs

These parameters configure the drive's physical digital outputs (relay & frequency/digital).

D1: Relay Output 1

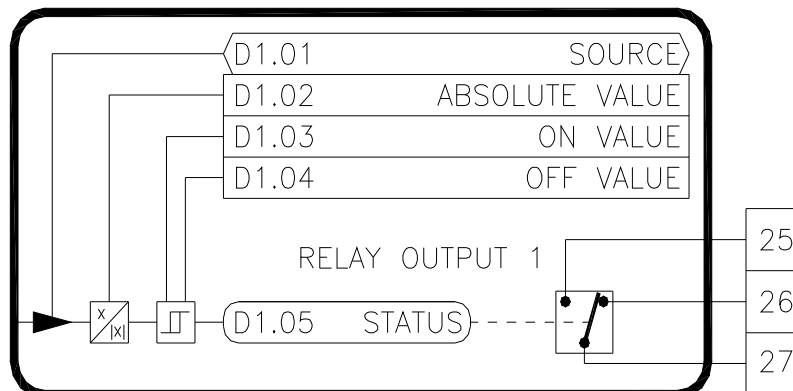


Figure 29

D1.01 Relay Output 1 Source (ICR, Preset: S1.06 [Zero Speed])

The function of the relay output is configured by this parameter. Each output can be controlled by any parameter in the drive. The source parameter contains the tag of the parameter that will control the relay output. The source parameter's value is compared to the On Value and Off Value parameters (Dx.03 & Dx.04) to determine if the relay is energized or de-energized. Refer to Table 7 for a list of commonly used functions.

Value	Function
G3.05	IN FIELD ECONOMY
H1.13	DRIVE IN RUN MODE
H1.14	DRIVE IN JOG MODE
H1.16	DRIVE RUNNING (RUN or JOG)
J1.22	DRIVE RAMPING/AT SPEED
K2.08	DRIVE FAULT
K2.10	DRIVE READY
S1.06	AT ZERO SPEED
S1.07	AT STANDSTILL

Table 7: Common Relay & Digital Output Functions

D1.02 Relay Output 1 Absolute Value (R/W, Preset: Off)

When TRUE, the absolute value of the source parameter's value is taken before it is compared to the Dx.03 and Dx.04.

D1.03 Relay Output 1 On Value (R/W, Preset: On)

The relay will energize (turn on) when the source parameter's value is greater than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D1.04 Relay Output 1 Off Value (R/W, Preset: Off)

The relay will de-energize (turn off) when the source parameter's value is less than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D1.05 Relay Output 1 Status (RO)

Displays the status of the relay output.

D2: Relay Output 2

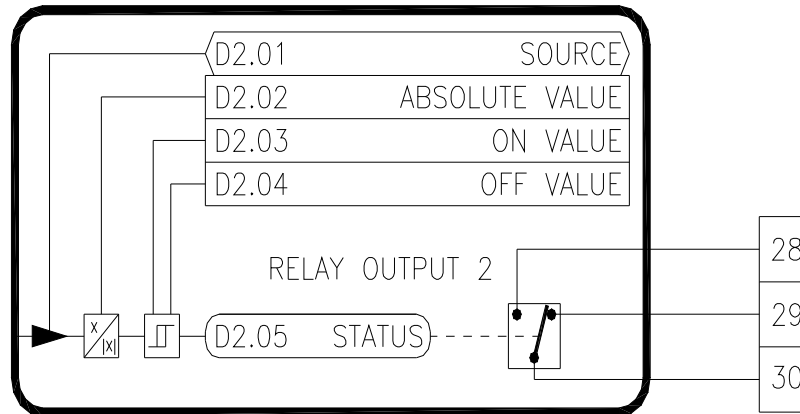


Figure 30

D2.01 Relay Output 2 Source (ICR, Preset: H1.16 [Drive Running])

D2.02 Relay Output 2 Absolute Value (R/W, Preset: Off)

D2.03 Relay Output 2 On Value (R/W, Preset: On)

D2.04 Relay Output 2 Off Value (R/W, Preset: Off)

D2.05 Relay Output 2 Status (RO)

Relay Output 2 is functionally equivalent to Relay Output 1. Refer to D1.XX

D3: Relay Output 3

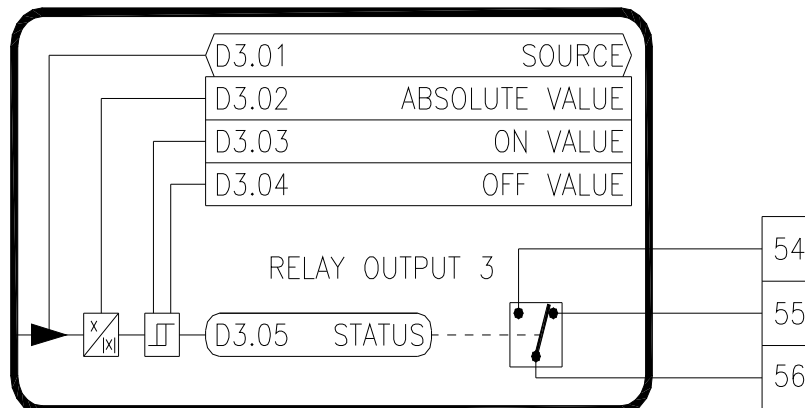


Figure 31

D3.01 Relay Output 3 Source (ICR, Preset: K2.08 [Drive Faulted])

D3.02 Relay Output 3 Absolute Value (R/W, Preset: Off)

D3.03 Relay Output 3 On Value (R/W, Preset: No)

D3.04 Relay Output 3 Off Value (R/W, Preset: Yes)

D3.05 Relay Output 3 Status (RO)

Relay Output 2 is functionally equivalent to Relay Output 1. Refer to D1.XX

D4: Frequency/Digital Output

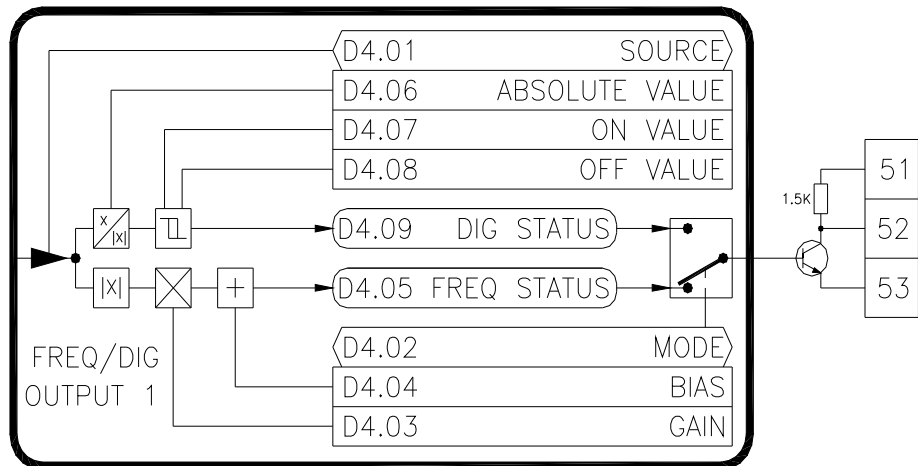


Figure 32

D4.01 Freq/Digital Output Source (ICR, Preset: 00.00 [Not Set])

The function of this output is configured by this parameter. The output can be controlled by any parameter in the drive. The source parameter contains the tag of the parameter that will control the relay output. Refer to Table 7 for a list of commonly used functions when used as a digital output. Refer to Table 8 for a list of commonly used functions when used as a frequency output.

D4.02 Freq/Digital Output Mode (ICR, Preset: Freq Out)

This open collector output can function in either a frequency or digital mode. In **FREQ OUT** mode, the output is a pulse train. The frequency level of the output is based on the source parameter's value. In **DIGITAL OUT** mode, the output is level is driven either on or off (similar to a relay output).

D4.03 Freq Output Gain (R/W, Preset: 100.00%)

Used only in the **FREQ OUT** mode. This adjustment is used to scale the output level of the pulse train. A gain of 100% with a source parameter value of 100% will yield maximum output frequency (10kHz). Range: 0..300%

D4.04 Freq Output Bias (R/W, Preset: 0.00%)

Used only in the **FREQ OUT** mode. This adjustment is used to set a minimum frequency output level. The percentage adjustment is based on the maximum frequency output level (10kHz). Range: 0..300%

D4.05 Freq Output Status (RO)

Used only in the **FREQ OUT** mode. Displays the frequency output level.

D4.06 Digital Output Absolute Value (R/W, Preset: Off)

Used only in the **DIG OUT** mode. When **TRUE**, the absolute value of the source parameter's value is taken before it is compared to the D4.07 and D4.08.

D4.07 Digital Output On Threshold (R/W, Preset: 0.01)

Used only in the **DIG OUT** mode. The output will turn on (sink current) when the source parameter's value is greater than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D4.08 Digital Output Off Threshold (R/W, Preset: 0.00)

Used only in the **DIG OUT** mode. The output will turn off when the source parameter's value is less than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D4.09 Digital Output Status (RO)

Used only in the **DIG OUT** mode. Displays the status of the digital output, either **ON** or **OFF**

D5: Aux LED Output

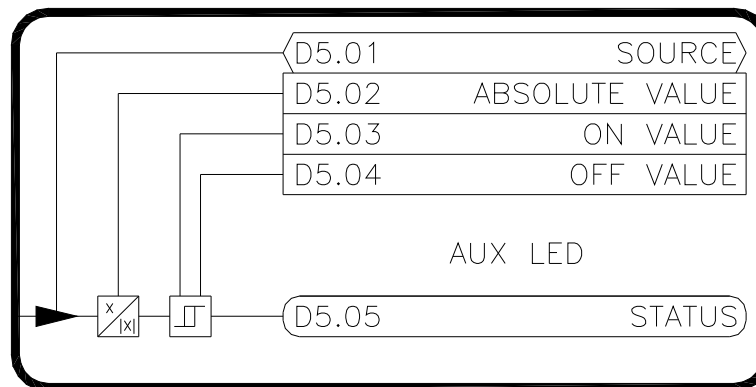


Figure 33

D5.01 Aux LED Source (ICR, Preset: H1.16 [Arm Pilot Status])

The function of this output is configured by this parameter. The output can be controlled by any parameter in the drive. The source parameter contains the tag of the parameter that will control the relay output. Refer to Table 7 for a list of commonly used functions.

D5.02 Aux LED Absolute Value (R/W, Preset: Off)

When **TRUE**, the absolute value of the source parameter's value is taken before it is compared to the D5.03 and D5.04.

D5.03 Aux LED On Value (R/W, Preset: On)

The LED will turn on when the source parameter's value is greater than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D5.04 Aux LED Off Value (R/W, Preset: Off)

The LED will turn off when the source parameter's value is less than or equal to this value. The limits and units of this parameter will change to match the limits and units of the source parameter.

D5.05 Aux LED Output Status (RO)

Displays the status of the LED output.

7.5 E: Analog Outputs

These parameters configure the drive's physical analog outputs.

E1: Analog Output 1

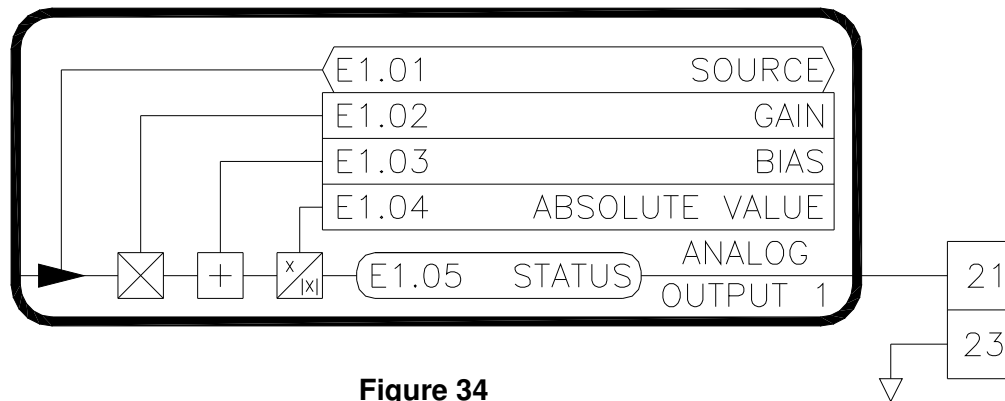


Figure 34

E1.01 Analog Output 1 Source (ICR, Preset: G2.18 [Filtered Velocity Feedback])

The function of this output is configured by this parameter. The output can be controlled by any parameter in the drive. The source parameter contains the tag of the parameter that will control the analog output level. Refer to Table 8 for a list of commonly used functions.

Value	Function
G1.13	MOTOR ARM CURRENT
G2.07	MOTOR ARM VOLTAGE
G2.18	MOTOR SPEED
G3.09	MOTOR FIELD CURRENT
G3.13	MOTOR FIELD VOLTAGE
I1.10	REFERENCE
J1.21	RAMP OUTPUT
L1.25	AUX PID OUTPUT

Table 8: Common Analog & Freq Output Functions

E1.02 Analog Output 1 Gain (R/W, Preset: 100.00%)

This adjustment is used to scale the output level. A gain of 100% with a source parameter value of 100% will yield maximum output level of 10V. Range: -300..300%

E1.03 Analog Output 1 Bias (R/W, Preset: 0.00%)

This adjustment is used to set a minimum output level. The percentage adjustment is based on the maximum output level (10V). Range: -300..300%

E1.04 Analog Output 1 Absolute Value (R/W, Preset: Off)

When **TRUE**, the absolute value is taken after the Bias and Gain have been applied to the source parameter's value. This effectively makes the output unipolar (positive only).

E1.05 Analog Output 1 Status (RO)

Displays the raw digital to analog output level. Refer to Table 9 for typical values.

Status	Voltage
+10V	4095
+5V	2047
0V	0
-5V	-2047
-10V	-4095

Table 9: Analog Output Status

E2: Analog Output 2

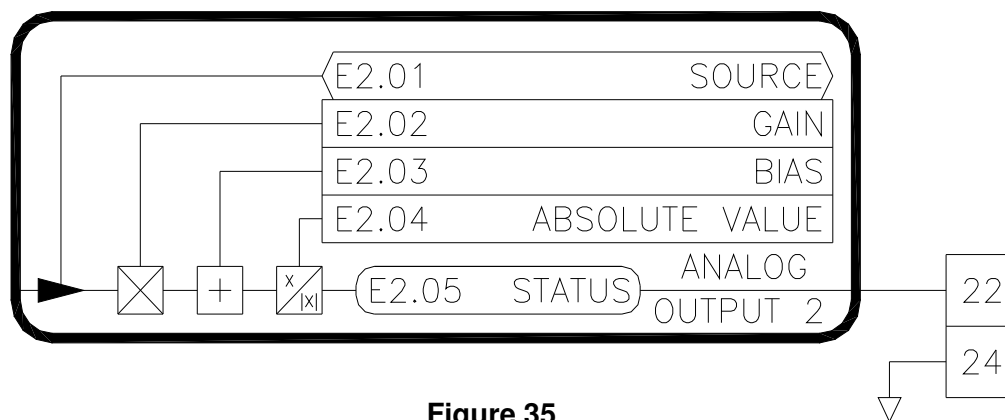


Figure 35

E2.01 Analog Output 2 Source (ICR, Preset: G1.13 [Filtered Current Feedback])

E2.02 Analog Output 2 Gain (R/W, Preset: 100.00%)

E2.03 Analog Output 2 Bias (R/W, Preset: 0.00%)

E2.04 Analog Output 2 Absolute Value (R/W, Preset: Off)

E2.05 Analog Output 2 Status (RO)

Analog Output 2 is functionally equivalent to Analog Output 1. Refer to E1.XX

7.6 F: Motor Data

F1: Motor Data

MOTOR DATA	
F1.01	AC LINE VOLTAGE
F1.02	ARMATURE CURRENT
F1.03	ARMATURE VOLTAGE
F1.04	BASE SPEED FIELD CURRENT
F1.05	EXT SPEED FIELD CURRENT
F1.06	BASE SPEED FIELD VOLTAGE
F1.07	BASE SPEED
F1.08	EXTENDED SPEED

Figure 36

F1.01 AC Line Voltage (ICR, Preset: 0V)

Enter the approximate input voltage level of the incoming three phase. This value is used to pre-calculate the Field Open Loop Reference (G3.03).

F1.02 Armature Current (ICR, Preset: 0A)

Enter the motor nameplate armature current rating.

F1.03 Armature Voltage (ICR, Preset: 0V)

Enter the motor nameplate armature voltage rating.

F1.04 Base Speed Field Amps (ICR, Preset: 0.00A)

Enter the motor nameplate base speed field current rating.

F1.05 Extended Speed Field Amps (ICR, Preset: 0.00A)

Enter the motor nameplate extended speed field current rating.

F1.06 Base Speed Field Volts (ICR, Preset: 0V)

Enter the motor nameplate base speed field voltage rating.

F1.07 Base Speed (ICR, Preset: 0 RPM)

Enter the motor nameplate base speed rating.

F1.08 Extended Speed (ICR, Preset: 0 RPM)

Enter the motor nameplate extended speed rating.

F2: Tachometer Data

This section is utilized only if a motor mounted tachometer is used for speed feedback.

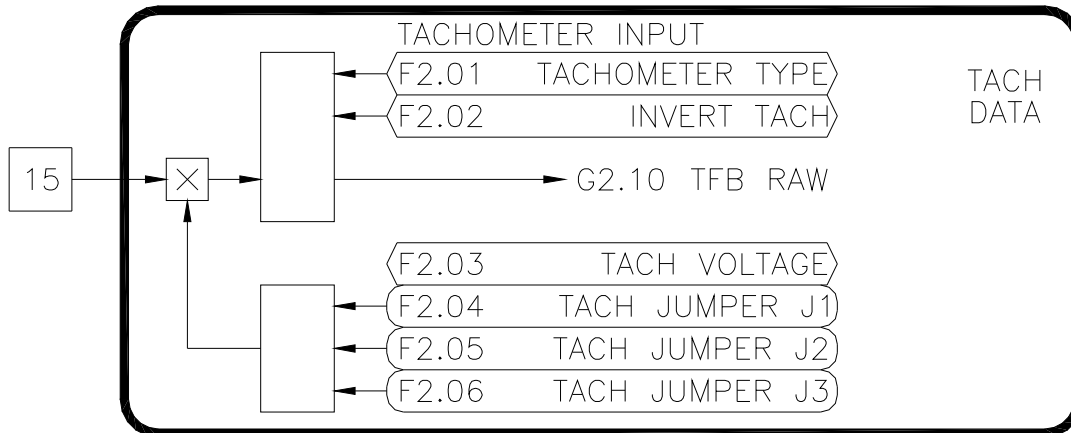


Figure 37

F2.01 Tachometer Type (ICR, Preset: 0 RPM)

Select the type of tachometer used: **AC** or **DC**.

F2.02 Invert Tachometer (ICR, Preset: Off)

The tachometer feedback signal is polarity sensitive. The polarity is used to determine the direction of rotation of the motor. If the tachometer wires are reversed, this parameter can be used to invert (i.e. swap) the polarity of the tachometer signal without re-wiring.

F2.03 Tachometer Volts/1000 RPM (ICR, Preset: 50V)

The tachometer feedback signal is polarity sensitive. The polarity is used to determine the direction of rotation of the motor. If the tachometer wires are reversed, this parameter can be used to invert (i.e. swap) the polarity of the tachometer signal without re-wiring. Range: 1..250V

F2.04 Tach Jumper J1 (RO)

F2.05 Tach Jumper J2 (RO)

F2.06 Tach Jumper J3 (RO)

The drive calculates the maximum tachometer voltage based on the motor and tachometer data entered. Jumpers J1-J3 on the control board should be set to these values.

F3: Encoder Data

This section is utilized only if a motor mounted encoder is used for speed feedback.

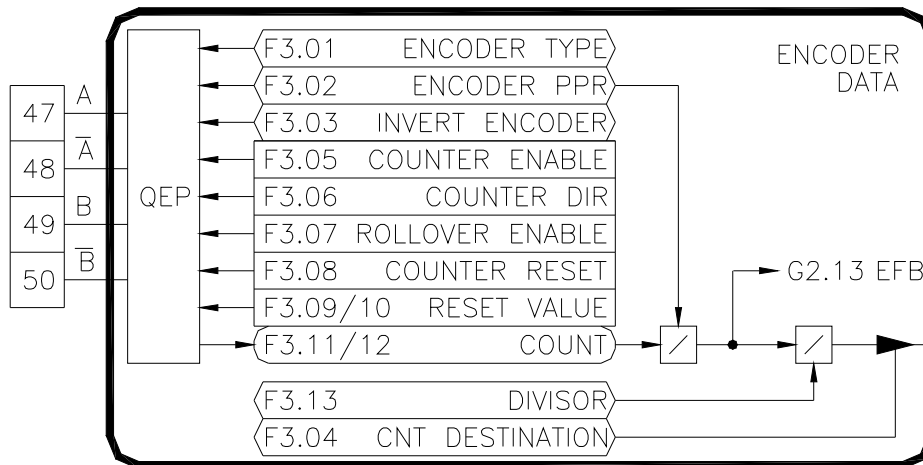


Figure 38

F3.01 Encoder Type (ICR, Preset: Quadrature)

Select the type of encoder used. A **QUADRATURE** encoder has two channels (typically labeled A and B) that conveys speed and direction information. A **PULSE & DIR** encoder also has two channels. One channel transmits speed and the other transmits direction. A **PULSE** encoder only has one channel (typically labeled A) that conveys only speed information.

F3.02 Encoder Pulses/Rev (ICR, Preset: 1024)

Enter the number of pulses produced by the encoder in one revolution.

F3.03 Invert Encoder Direction (ICR, Preset: Off)

When using a **QUADRATURE** or **PULSE & DIR** encoder, the encoder conveys motor direction to the drive. If the encoder wires are reversed, this parameter can be used to invert (i.e. swap) the polarity of the encoder signal without re-wiring.

F3.04 Counter Destination (ICR, Preset: 00.00 [Not Set])

The encoder input also has counter functionality. The count value can be written to any R/W parameter in the drive. The destination parameter contains the tag of the parameter the input will control (i.e. the target parameter).

F3.05 Counter Enable (R/W, Preset: Disabled)

Enables/disables the counter. When **ENABLED**, each pulse on the input causes the counter (F3.11:F3.12) to increment or decrement.

F3.06 Counter Direction (R/W, Preset: Auto)

Determines whether the counter is incremented or decremented when a pulse occurs on the input. When set to **UP**, the counter will increment. When set to **DOWN**, the counter will decrement. The **AUTO** selection is only valid when a **QUADRATURE** or **PULSE & DIR** encoders are used. In this mode, the counter will count up and down depending upon the direction of rotation of the encoder.

F3.07 Rollover Enable (R/W, Preset: Disabled)

When **ENABLED**, the counter is allowed to rollover from maximum to minimum when counting up, or to rollover from minimum to maximum when counting down. If **DISABLED**, rollover is not allowed and the count value will stop and hold its value at the maximum or minimum.

F3.08 Counter Reset (R/W, Preset: Off)

When **ON**, the values from F3.09 & F3.10 are transferred to the counter at F3.11:F3.12.

F3.09 Reset Value Lo (R/W, Preset: 0)

F3.10 Reset Value Hi (R/W, Preset: 0)

The 32 bit counter will be preset to the value in these two registers when F3.08 is **ON**.

F3.11 Counter Value Lo (RO)

F3.12 Counter Value Hi (RO)

The 32 bit counter is split into two 16 bit sections (F3.11:F3.12). The counter has a maximum value of 4,294,967,295.

F3.13 Divisor (ICR, Preset: 1)

The 32 bit count value is divided by this value before being written to the target parameter.

7.7 G: Control Loops

G1: Current Loop

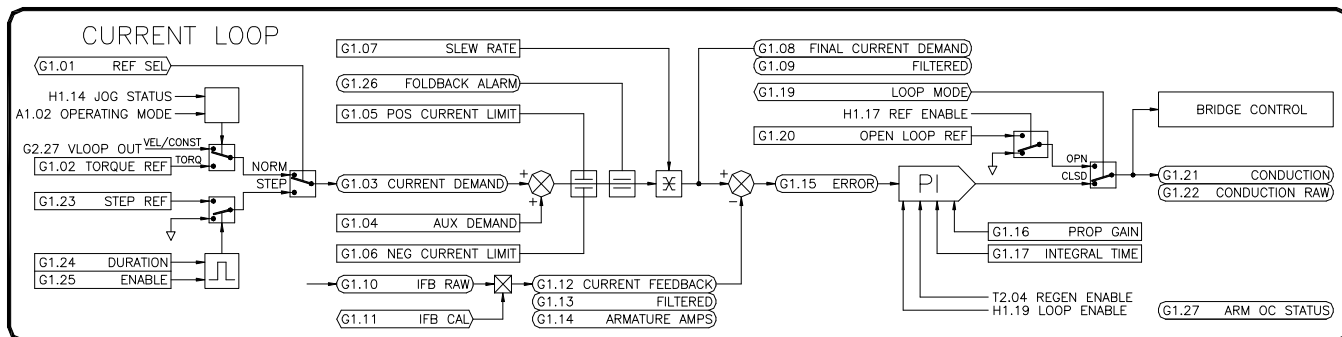


Figure 39

G1.01 Reference Select (ICR, Preset: Normal)

Selects the reference source for the loop. This parameter should always be set to **NORMAL** except when performing a step response loop tuning sequence.

G1.02 Torque Reference (R/W, Preset: 0.00%)

This is the current loop's reference when A1.02 is set to **TORQUE** mode. In the factory preset configuration, the Ramp 1 Output (J1.21) is linked to this parameter. Range: -150..150%

G1.03 Current Demand (RO)

This is the current loop's demand signal. It reflects the level of current that is demanded from either the Velocity Loop or the Torque Reference.

G1.04 Aux Demand (R/W, Preset: 0.00%)

An additional current demand signal can be summed with the G1.03. This parameter is mainly used in engineered applications. Range: -150..150%

G1.05 Positive Current Limit (R/W, Preset: 150.00%)

This parameter sets the maximum level of positive current that can be demanded. Positive current is used when the drive is motoring in the forward direction and regenerating in the reverse direction. Range: 0..150%

G1.06 Negative Current Limit (R/W, Preset: 150.00%)

This parameter sets the maximum level of negative current that can be demanded. Negative current is used when the drive is motoring in the reverse direction and regenerating in the forward direction. Range: 0..150%

G1.07 Slew Rate (R/W, Preset: 0.00%)

This parameter limits the rate of change of the current demand. The setting is as follows:

$$G1.07 = \frac{100 \times S}{F1.02 \times 6 \times f}$$

where S is the desired slew rate in amps/sec and f is the line frequency (50 or 60Hz). Note: setting this adjustment to zero disables the slew rate limit function. Range: 0..100%

G1.08 Final Current Demand (RO)

This parameter is the result of the summation of G1.03 and G1.04 after all of the current limits, foldback, and slew rate limits are applied.

G1.09 Filtered Final I Demand (RO)

A filtered version of G1.08.

G1.10 Current FB Raw (RO)

This is the raw analog to digital conversion value of the armature current feedback signal.

G1.11 Current FB Cal Gain (R/W, Preset: Varies by drive, typically 100%)

This is a calibration adjustment that is set at the factory. Customer adjustment is typically not required. Range: 90..110% (G1.11=ACTUAL/DISPLAYED*G1.11)

G1.12 Current Feedback (RO)

This status parameter indicates the level of armature current flowing in the motor. The reading is a percentage of F1.02.

G1.13 Filtered Current Feedback (RO)

A filtered version of G1.12.

G1.14 Armature Amps (RO)

G1.13 expressed in amps.

G1.15 Current Error (RO)

The difference between the final current demand (G1.08) and the current feedback (G1.12). This signal is the input to the PI loop.

G1.16 Current Prop Gain (R/W, Preset: 2.30)

Sets the loop response. Increasing the gain improves the response of the drive but can also increase overshoot. Range: 0..15

G1.17 Current Integral Time (R/W, Preset: 0.164 Secs)

Sets the loop response. Decreasing the integral time improves the response of the drive. Setting it too low can cause oscillations in the current. Range: 0.001..30 Secs

G1.19 Current Loop Mode (ICR, Preset: Closed Loop)

Diagnostic setting. Normally this parameter will always be in the **CLOSED LOOP** mode. When in **OPEN LOOP** mode, the current loop is bypassed and G1.20 controls the conduction angle of the armature SCRs.

G1.20 Open Loop Reference (R/W, Preset: 0.00%)

Diagnostic setting. When G1.19 is in the OPEN LOOP mode, this value sets the conduction angle. In the factory preset configuration, the Ramp 1 Output is linked to this parameter. Range: 0..100%

G1.21 Conduction (RO)

This is the output of the current loop. It is an input to the trigger board armature control.

G1.22 Conduction Raw (RO)

The raw conduction value.

G1.23 Step Reference (R/W, Preset: 0.00%)

Used only when G1.01 is set to **STEP**. Sets the level of current demand during a step level response test. Range: -150..150%

G1.24 Step Duration (R/W, Preset: 0.200 Secs)

Used only when G1.01 is set to **STEP**. Sets the amount of time in seconds that G1.22 is applied during the step level response test. Range: 0..10 Secs

G1.25 Step Enable (R/W, Preset: Off)

Used only when G1.01 is set to **STEP**. When set to **ON**, G1.22 is applied to G1.03 for the amount of time set by G1.23. The value then automatically returns to **OFF**.

G1.26 Armature Foldback Alarm (RO)

In the factory preset configuration, the drive can provide up to 150% of the nameplate motor armature current for a programmable time (see K1.11). After the drive has been producing current over 105% for this amount of time, a Foldback Alarm is generated (indicated by this parameter being **ON**). When the Foldback Alarm is **ON**, the final current demand is limited to 110%. If the armature current falls below the 105% level, the Foldback Alarm is cleared and the timer resets.

G1.27 Armature Over Current Status (RO)

The drive can continue to operate while a Foldback Alarm is active for K1.12 seconds. After the over current timer expires, this parameter will momentarily be set to **ON** and an Over Current fault will be generated.

G2: Velocity Loop

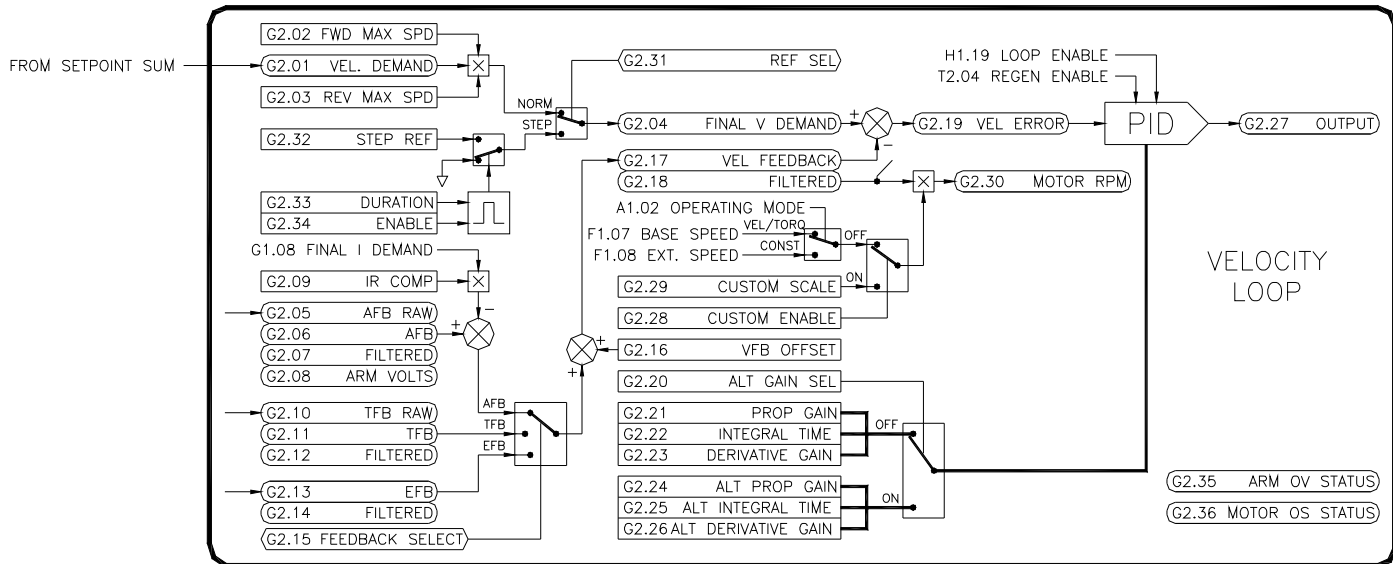


Figure 40

G2.01 Velocity Demand (RO)

This value is the summation of the setpoints in the Setpoint Sum (I2) block. It serves as the initial reference for the velocity (or speed) loop.

G2.02 Forward Max Speed Scale (R/W, Preset: 100.00%)

This parameter allows scaling of the Velocity Demand (G2.01). This parameter is only used when G2.01 is positive. Range: 0..105%

G2.03 Reverse Max Speed Scale (R/W, Preset: 100.00%)

This parameter allows scaling of the Velocity Demand (G2.01). This parameter is only used when G2.01 is negative. Range: 0..105%

G2.04 Final Velocity Demand (RO)

This parameter is the result of the scaling of G2.01 by G2.02 and G2.03 when Reference Select (G2.29) is set to NORMAL.

G2.05 Armature VFB Raw (RO)

This is the raw analog to digital conversion value of the armature voltage feedback signal.

G2.06 Armature VFB (RO)

This status parameter indicates the level of armature voltage on the motor. The reading is a percentage of F1.03.

G2.07 Armature VFB Filter (RO)

Filtered version of G2.06.

G2.08 Armature Volts (RO)

G2.07 expressed in volts.

G2.09 I.R. Comp (R/W)

Internal Resistance losses in the motor armature can cause decreased speed regulation on loaded motors when using armature voltage as the velocity feedback. The IR Comp adjustment can be used to increase the speed regulation by summing a small amount of negative Current Feedback with the Armature Voltage Feedback. Range: 0..30.00%

G2.10 Tachometer FB Raw (RO)

This is the raw analog to digital conversion value of the tachometer voltage feedback signal.

G2.11 Tachometer Feedback (RO)

This status parameter indicates the level of tachometer voltage feedback. The reading is a percentage of the maximum tachometer voltage programmed via control board jumpers J1-J3.

G2.12 Tachometer Feedback Filtered (RO)

Filtered version of G2.11.

G2.13 Encoder Feedback (RO)

This status parameter indicates the level of encoder feedback. The reading is a percentage of the maximum encoder frequency calculated from F1.07 (Base Speed) or F1.08 (Extended Speed) and F3.02 (Encoder PPR).

G2.14 Encoder Feedback Filtered (RO)

Filtered version of G2.13.

G2.15 Feedback Select (ICR, Preset: Armature)

Selects the source of velocity (speed) feedback. **ARMATURE** uses the motor voltage as feedback. **TACHOMETER** uses a motor mounted tachometer (tachgenerator). **ENCODER** uses a motor mounted pulse generator. **TACH-JOG IN ARM** uses a tachometer in run mode, but uses armature while jogging. **ENCODER-JOG IN ARM** uses an encoder in run mode, but uses armature while jogging.

G2.16 VFB Offset (R/W, Preset: 0.00%)

This parameter allows any offset in the velocity feedback circuit to be zeroed. Proper adjustment should yield 0.00% at G2.18 when the motor is not turning. Range: -10..+10%

G2.17 Velocity Feedback (RO)

Status parameter that displays the level feedback selected by G2.15. This is the motor speed expressed as a percentage of either F1.07 (Base Speed) or F1.08 (Extended Speed).

G2.18 Velocity Feedback Filtered (RO)

Filtered version of G2.18

G2.19 Velocity Error (RO)

The difference between the final velocity demand (G2.04) and the velocity feedback (G2.17). This signal is the input to the PI loop.

G2.20 Alternate Gain Select (R/W, Preset: Off)

The Velocity PID loop uses the Prop Gain, Integral Time, & Derivative Gain to control the response of the of the drive. As the application process is running, external conditions or variables may change (diameter of a roll for example). In some cases, it may be desirable to switch to an alternate set of loop adjustments so that the drive can better respond to the new operating conditions. When set to **OFF**, G2.21-G2.23 are used. When set to **ON**, G2.24-G2.26 are used.

G2.21 Velocity Prop Gain (R/W, Preset: 9.000)

Sets the loop response. Increasing the gain improves the response of the drive but can also increase overshoot. Range: 0..20

G2.22 Velocity Integral Time (R/W, Preset: 0.164 Secs)

Sets the loop response. Decreasing the integral time improves the response of the drive. Setting it too low can cause oscillations in the motor speed. Range: 0..30 Secs

G2.23 Velocity Derivative Gain (R/W, Preset: 0.000)

Sets the loop response. Increasing the derivative gain improves the response of the drive. Setting it too high can cause oscillations in motor speed. Range: 0..30

G2.24 Velocity Prop Gain Alt (R/W, Preset: 5.000)

Same as G2.21. Used only when G2.20 is **ON**. Range: 0..20

G2.25 Velocity Integral Time Alt (R/W, Preset: 0.700 Secs)

Same as G2.22. Used only when G2.20 is **ON**. Range: 0..30 Secs

G2.26 Velocity Derivative Gain Alt (R/W, Preset: 0.700 Secs)

Same as G2.23. Used only when G2.20 is **ON**. Range: 0..30

G2.27 Velocity Loop Output (RO)

The output of the velocity loop that serves as the input to the current loop.

G2.28 Custom Scale Enable (R/W, Preset: Off)

Normally, the motor RPM readout (G2.30) is calculated from the filtered velocity feedback (G2.18) and either the Base Speed (F1.07) or Extended Speed (F1.08) settings. In some cases, the displayed Motor RPM (G2.28) may not be correct due to motor inconsistencies. When set to **ON**, a Custom Scale (G2.29) can be used so that the correct motor RPM is displayed.

G2.29 Custom Scale (R/W, Preset: 0 RPM)

When G2.28 is set to **ON**, the filtered velocity feedback is multiplied by this parameter to produce the Motor RPM (G2.30). Adjust this parameter until G2.28 reads the correct speed.

Range: 0..10,000 RPM

G2.30 Motor RPM (RO)

Displays the current motor speed in RPM. When G2.15 is set to **ARMATURE**, this readout should be considered an approximate speed. If the displayed value is incorrect, a custom scale can be used. See G2.28 and G2.29.

G2.31 Reference Select (ICR, Preset: Normal)

Selects the reference source for the loop. This parameter should always be set to **NORMAL** except when performing a step response loop tuning sequence.

G2.32 Step Reference (R/W, Preset: 0.00%)

Used only when G2.31 is set to **STEP**. Sets the level of current demand during a step level response test. Range: -100..100%

G2.33 Step Duration (R/W, Preset: 2 Secs)

Used only when G2.31 is set to **STEP**. Sets the amount of time in seconds that G2.32 is applied during the step level response test. Range: 0..30 Secs

G2.34 Step Enable (R/W, Preset: Off)

Used only when G2.31 is set to **STEP**. When set to **ON**, G2.32 is applied to the final velocity demand (G2.04) for the amount of time set by G2.33. The value then automatically returns to **OFF**.

G2.35 Armature OV Status (RO)

This status parameter has a value of **ON** when the motor voltage exceeds 120%. An overvoltage fault is generated when this occurs.

G2.36 Motor Overspeed Status (RO)

This status parameter is only valid when the G2.15 is set to **TACHOMETER** or **ENCODER**. This status parameter has a value of **ON** when the filtered velocity feedback (G2.18) is greater than the motor overspeed level (K1.13). An overspeed fault is generated when this occurs.

G3: Field Loop

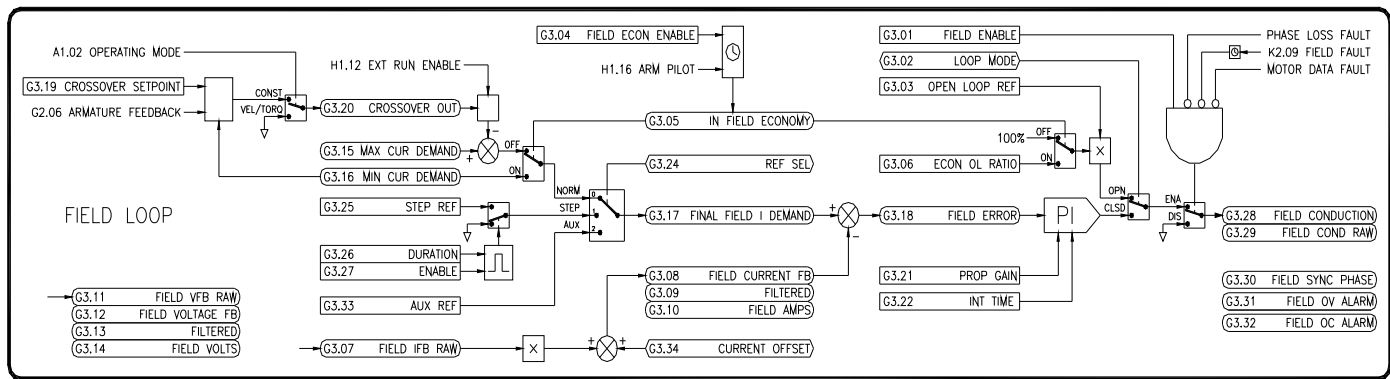


Figure 41

G3.01 Field Enable (R/W, Preset: On)

This setting must be **ON** in order for the drive to produce field output. If using a permanent magnet motor or a non-motor application, this setting should be set to **OFF**.

G3.02 Loop Mode (R/W, Preset: Open Loop)

Sets the operating mode of the field loop. When set to **OPEN LOOP**, a voltage is produced on the field that is a percentage of the incoming AC line voltage. When set to **CLOSED LOOP**, the loop regulates the field current in the motor.

G3.03 Open Loop Reference (R/W, Preset: 0.00%)

Used only when G3.02 is set to OPEN LOOP. This parameter sets the conduction angle of the field SCRs. Increasing this value will increase field voltage. Decreasing this value will decrease field voltage. This value will typically be automatically set if the Basic Drive Setup Wizard is used. Range: 0..100%

G3.04 Field Economy (R/W, Preset: Enabled)

The Field Economy feature can help extend the life of a motor by reducing motor heat that is generated from the field windings. The drive's field output can automatically be reduced when the drive is in the Stop mode after 3 minutes. The field will automatically return to its normal level when the Run or Jog mode is entered. Setting this parameter to **ENABLED** turns on this feature. When G3.02 is set to **OPEN LOOP** and economy goes into effect, the field output reduction is set by G3.06. When G3.02 is set to **CLOSED LOOP** and economy goes into effect, the field current is reduced to the level set by F1.05.

G3.05 In Field Economy (RO)

YES indicates the field economy feature is active.

G3.06 Field Econ OL Ratio (R/W, Preset: 60.00%)

Used only when G3.02 is set to OPEN LOOP. This ratio is multiplied by the Open Loop Reference (G3.03) to set the Field Conduction (G3.27) when field economy is active. Range: 0..100%

G3.07 Field Current FB Raw (RO)

This is the raw analog to digital conversion value of the field current feedback signal.

G3.08 Field Current FB (RO)

This status parameter indicates the level of field current in the motor. The reading is a percentage of the drive's rated maximum field current (T1.03).

G3.09 Field Current FB Fil (RO)

Filtered version of G3.08.

G3.10 Field Amps (RO)

G3.09 expressed in amps.

G3.11 Field VFB Raw (RO)

This is the raw analog to digital conversion value of the field voltage feedback signal.

G3.12 Field VFB (RO)

This status parameter indicates the level of field voltage on in the motor. The reading is a percentage of the drive's rated maximum field voltage of 400V.

G3.13 Field VFB Fil (RO)

Filtered version of G3.12.

G3.14 Field Volts (RO)

G3.13 expressed in volts.

G3.15 Max Field I Demand (RO)

Motor Base Speed Field Current (F1.04) expressed as a percentage of the drive's maximum rated field current (T1.03).

G3.16 Min Field I Demand (RO)

Motor Extended Speed Field Current (F1.05) expressed as a percentage of the drive's maximum rated field current (T1.03).

G3.17 Final Field I Demand (RO)

Used only when G3.02 is set to CLOSED LOOP. Its value is determined by the Reference Select (G3.23) and serves as the loop's reference.

G3.18 Field Error (RO)

Used only when G3.02 is set to CLOSED LOOP. The difference between the Final Field I Demand (G3.17) and the Field Current FB (G3.08). This signal is the input to the PI loop.

G3.19 Field Crossover Setpoint (R/W, Preset: 85.00%)

Used only when A1.02 is set to CONST HP (CROSSOVER). The Armature Feedback level at which Field Crossover operation begins. As the Armature Feedback (G2.06) increases beyond this threshold, the Final Field I Demand (G3.17) is reduced. When rated armature voltage is reached (at 100%), G3.17 will have been reduced to the Min Field I Demand level (G3.16).
Range: 50..95%

G3.20 Field Crossover Output (RO)

Used only when A1.02 is set to CONST HP (CROSSOVER). This parameter value is subtracted from the Max Field I Demand (G3.15) to reduce the level of field current in the motor.

G3.21 Field Prop Gain (R/W, Preset: 1.2500)

Sets the loop response. Increasing the gain improves the response of the drive but can also increase overshoot. Range: 0..6

G3.22 Field Integral Time (R/W, Preset: 0.2000 Secs)

Sets the loop response. Decreasing the integral time improves the response of the drive. Setting it too low can cause oscillations in the motor speed. Range: 0..3 Secs

G3.24 Field Ref Select (ICR, Preset: Normal)

Selects the reference source for the loop. This parameter should typically be set to **NORMAL**. Set to **STEP** when performing a step response loop tuning sequence. **AUX** is used to select G3.32 as the loop reference.

G3.25 Field Step Reference (R/W, Preset: 0.00%)

Used only when G3.23 is set to **STEP**. Sets the level of current demand during a step level response test. Range: 0..100%

G3.26 Field Step Duration (R/W, Preset: 0.200 Secs)

Used only when G3.23 is set to **STEP**. Sets the amount of time in seconds that G3.24 is applied during the step level response test. Range: 0..20 Secs

G3.27 Field Step Enable (R/W, Preset: Off)

Used only when G3.23 is set to **STEP**. When set to **ON**, G3.24 is applied to G3.17 for the amount of time set by G3.25. The value then automatically returns to **OFF**.

G3.28 Field Cond Angle (RO)

This is the output of the field loop. It is an input to the trigger board field control.

G3.29 Field Cond Angle Raw (RO)

The raw conduction value.

G3.30 Field Sync Phase (RO)

Displays the input phase synchronizing circuit that the drive is using.

G3.31 Over Voltage Alarm (RO)

Displays the status of the field over voltage alarm. ON indicates the alarm is active. Refer to K1.05 - K1.07 for alarm details.

G3.32 Over Current Alarm (RO)

Displays the status of the field over current alarm. ON indicates the alarm is active. Refer to K1.08 - K1.10 for alarm details.

G3.33 Aux Field Reference (R/W, Preset: 0.00%)

Used only when G3.23 is set to **AUX**. Serves as an auxiliary reference to the field loop. Typically used in engineered applications.

Range: 0..100%

G3.34 Field IFB Offset (ICR, Preset: Varies by drive, typically 0%)

This parameter allows any offset in the field current feedback circuit to be zeroed. Proper adjustment should yield 0.00% at G3.09 when the field is disabled (G3.01). Range: -10..+10%

7.8 H: Start/Stop Logic

H1: Start/Stop Logic

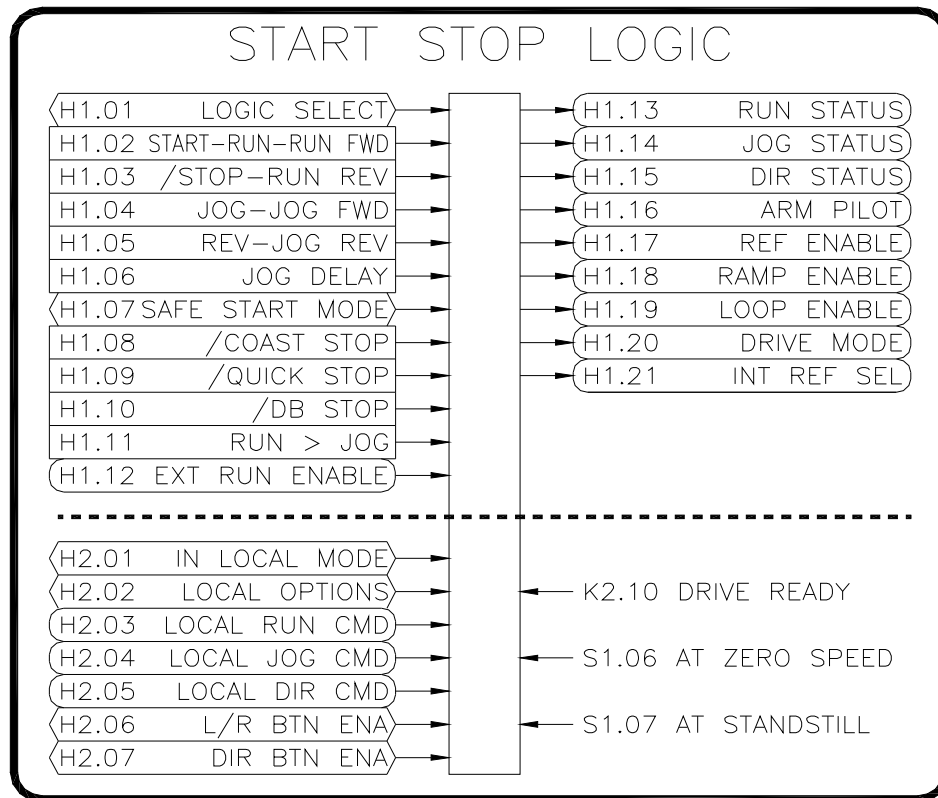


Figure 42

H1.01 Logic Select (ICR, Preset: Maintained Run/Dir)

Determines how the drive is started and stopped. There are four parameters that control the drive's mode and direction: H1.02-H1.05. Each of these parameters will have a different function depending upon the selection of H1.01. Typically, a digital input is linked to each of these parameters.

MOMENTARY (also known as 3 wire)

- H1.02 serves as the Start command
- H1.03 serves as the Ramp Stop command (active low)
- H1.04 serves as the Jog command
- H1.05 serves as the Reverse command

Drive will enter and stay in the run mode when H1.02 is momentarily **ON**. Drive will ramp to stop when H1.03 is momentarily **OFF**. Drive will Jog anytime H1.04 is **ON**. Reverse is selected when H1.05 is **ON**.

MAINTAINED RUN/DIR

- H1.02 serves as the Run command
- H1.03 is not used
- H1.04 serves as the Jog command
- H1.05 serves as the Reverse command

Drive will enter the run mode as long as H1.02 is **ON**. Drive will ramp to stop when H1.02 is **OFF**. Drive will Jog anytime H1.04 is **ON**. Reverse is selected when H1.05 is **ON**.

MAINTAINED RUNF/RUNR

H1.02 serves as the Run Forward command

H1.03 serves as the Run Reverse command

H1.04 serves as the Jog Forward command

H1.05 serves as the Jog Reverse command

In this mode, the drive will enter the indicated mode when the command is **ON**. The drive will ramp to stop when the input is **OFF**.

H1.02 Start-Run Forward (R/W, Preset: Off)

Refer to H1.01 for functionality.

H1.03 /Stop-Run Reverse (R/W, Preset: Off)

Refer to H1.01 for functionality.

H1.04 Jog-Jog Forward (R/W, Preset: Off)

Refer to H1.01 for functionality.

H1.05 Rev-Jog Reverse (R/W, Preset: Off)

Refer to H1.01 for functionality.

H1.06 Jog Delay Time (R/W, Preset: 3.0 Secs)

This adjustment serves to extend the mechanical life of the armature contactor by reducing the number of mechanical operations in an application where a high rate of repeat "jogging" is performed. When the Jog button is pressed and then released, the reference is immediately clamped to stop the motor but the contactor is held energized for a time set by this parameter. Pressing the Jog button again within this "delay" period will cause the motor to immediately jog and will reset the delay.

Range: 0..10 Secs

H1.07 Safe Start Mode (ICR, Preset: Enabled)

The drive incorporates a safety feature that prevents the drive running if a run command is present during power up. While NOT recommended by Carotron, this feature can be disabled if other external safety logic is used.

H1.08 /Coast Stop (R/W, Preset: On)

This command is active low (i.e. when in the **OFF** state). When **OFF**, the drive clamps all the control loops and the motor will coast to a stop. The armature contactor does not de-energize until zero speed is reached. The drive will enter the Stop mode when the /Coast Stop command is removed (i.e. **ON**).

H1.09 /Quick Stop (R/W, Preset: On)

This command is active low (i.e. when in the **OFF** state). When **OFF**, the drive performs a current limit stop. It will try and stop the motor as fast as possible. The drive will enter the Stop mode when the /Quick Stop command is removed (i.e. **ON**). Please note that this stopping method is only valid on a regenerative drive (see T1.07).

H1.10 /DynBrk Stop (R/W, Preset: On)

This command is active low (i.e. when in the **OFF** state). When **OFF**, the drive de-energizes the armature contactor by opening the contact on terminals TB1-57 & 60. The motor stopping time will be determined by the dynamic braking resistor. The drive will enter the Stop mode when the /DynBrk Stop command is removed (i.e. **ON**).

H1.11 Run Overrides Jog (R/W, Preset: Disabled)

When **DISABLED**, the drive is prevented from transitioning directly from the Jog mode to the Run mode. If **ENABLED** and a Run command (see H1.01) is received while jogging, the drive will transition to the Run mode.

H1.12 External Run Enable (RO)

Displays the status of the Run Enable terminal TB1-9. **ENABLED** indicates the presence of 24V on terminal 9.

H1.13 Run Status (RO)

Status of drive. **ON** indicates the drive is in the run mode. Note that this does not include the jog mode.

H1.14 Jog Status (RO)

Status of drive. **ON** indicates the drive is in the jog mode.

H1.15 Direction Status (RO)

Indicates the commanded direction of the drive: **FWD** or **REV**. See H1.01 for details.

H1.16 Arm Pilot Status (RO)

Indicates the status of the armature pilot relay. Its contacts are located at TB1-57 & 60. **ON** Indicates the drive is in the run or jog modes.

H1.17 Reference Enable (RO)

Used as an input to the Setpoints block (I1). Its value is **DISABLED** while drive is ramping to a stop or stopped.

H1.18 Ramp Enable (RO)

Used as an input to the Ramp 1 block (J1). Its value is **DISABLED** during a quick stop.

H1.19 Loop Enable (RO)

Used as an input to the control loops. Its value is **ENABLED** while drive is running or jogging. Exception is when drive is At Standstill (S1.06).

H1.20 Drive Mode (RO)

Indicates the status of the specific drive mode.

Numeric Value	Mode
0	STOP
1	RUN
2	RAMP STOP (FROM RUN)
3	JOG
4	RAMP STOP (FROM JOG)
5	JOG DELAY
6	QUICK STOP
7	COAST STOP
8	E-STOP
9	DB STOP
10	POWER UP
11	SAFE
12	CONTACTOR DELAY
13	FAULT

Table 10: Drive Modes

H1.21 Internal Ref Select (RO)

Used as an input to the Setpoints block (I1). Indicates which reference value is selected in the Setpoints block: **REF A-D**, **JOG REF**, **LOCAL REF**.

H2.01 In Local Mode (ICR, Preset: No)

Determines if the drive is in the Local mode of operation. The LOCAL/REMOTE key toggles this value.

H2.02 Local Options (ICR, Preset: LOCAL SS/LOCAL REF)

The drive can operate in one of three local modes.

LOCAL SS / LOCAL REF

Starting, stopping, & reference is controlled locally via the keypad.

LOCAL SS / REMOTE REF

Starting and stopping is controlled locally via the keypad. The drive uses a remote reference (i.e. REF A-D).

REMOTE SS / LOCAL REF

Starting and stopping is controlled remotely. The drive reference is controlled via the keypad.

H2.03 Local Run Command (RO)

ON indicates the drive is running in the local mode.

H2.04 Local Jog Command (RO)

ON indicates the drive is jogging in the local mode.

H2.05 Local Dir Command (RO)

Indicates the commanded direction in the local mode.

H2.06 Local/Remote Button (ICR, Preset: Enabled)

Enables/disables the LOCAL/REMOTE keypad button.

H2.07 Dir Button (ICR, Preset: Enabled)

Enables/disables the direction selection on the keypad when in the local mode. This parameter is valid only on regenerative models (see T1.07).

7.9 I: Setpoints

I1: Setpoints

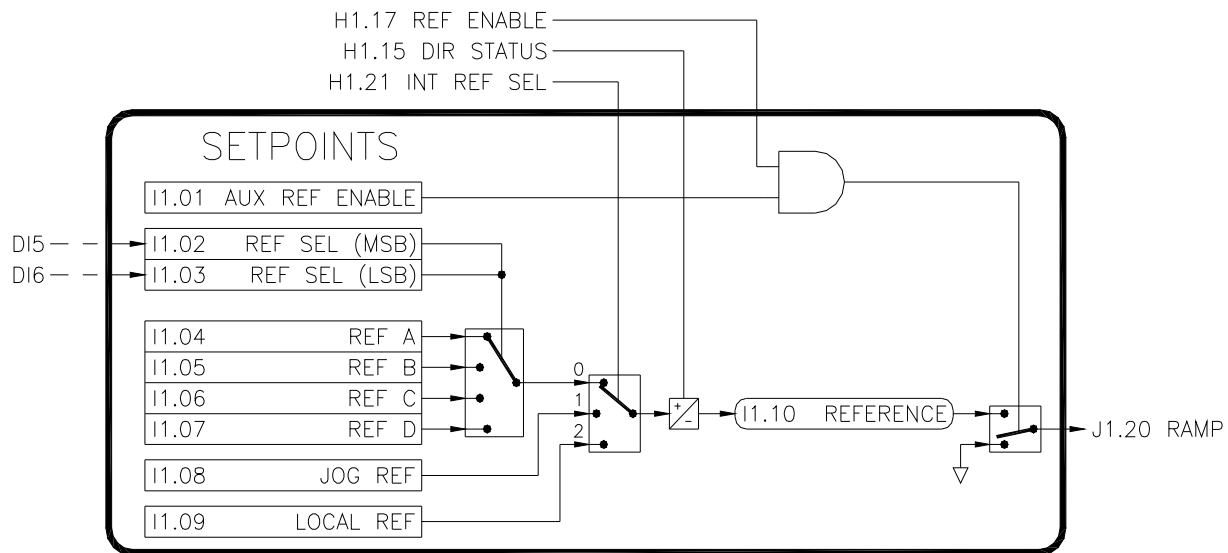


Figure 43

I1.01 Aux Reference Enable (R/W, Preset: Enabled)

Both H1.17 and this parameter must be ENABLED in order for the selected reference to be passed to the Ramp 1 block (J1). When used, this parameter is often linked from a digital input to confirm the armature contactor has closed.

I1.02 Reference Select (MSB) (R/W, Preset: Off)

I1.03 Reference Select (LSB) (R/W, Preset: Off)

The Reference Select parameters select between 4 internal references. I1.02 is the Most Significant Bit (MSB) and I1.03 is the Least Significant Bit (LSB). In the factory preset configuration, Digital Inputs 5 and 6 control the I1.02 & I1.03 respectively. The table below shows the 4 input combinations used to select the different references.

I1.02	I1.03	Reference
OFF	OFF	Reference A (I1.04)
OFF	ON	Reference B (I1.05)
ON	OFF	Reference C (I1.06)
ON	ON	Reference D (I1.07)

Table 11: Reference Select

I1.04 Reference A (R/W, Preset: 0.00%)

I1.05 Reference B (R/W, Preset: 10.00%)

I1.06 Reference C (R/W, Preset: 15.00%)

I1.07 Reference D (R/W, Preset: 20.00%)

One of these four values serves as the reference when the drive is in the run mode. I1.02 & I1.03 determine which value is selected. In the factory preset configuration, the Reference A value is controlled by Analog Input 1. Range: -300..300%

I1.08 Jog Reference (R/W, Preset: 5.00%)

This value serves as the speed reference when the drive is in the jog mode. Range: -300..300%

I1.09 Local Reference (R/W, Preset: 0.00%)

This value serves as the speed reference when the drive is in the local mode. See H2.02 for exceptions. Typically, this parameter value is edited by pressing the ENTER key when the DM01 screen is displayed and the drive is in LOCAL mode. Range: -300..300%

I1.10 Reference (RO)

This parameter indicates the value of the selected reference.

I2: Setpoint Sum

This block sums four setpoints together. The result is the Velocity Demand (G2.01) signal for the Velocity Loop. Each of the four setpoints has a multiplier.

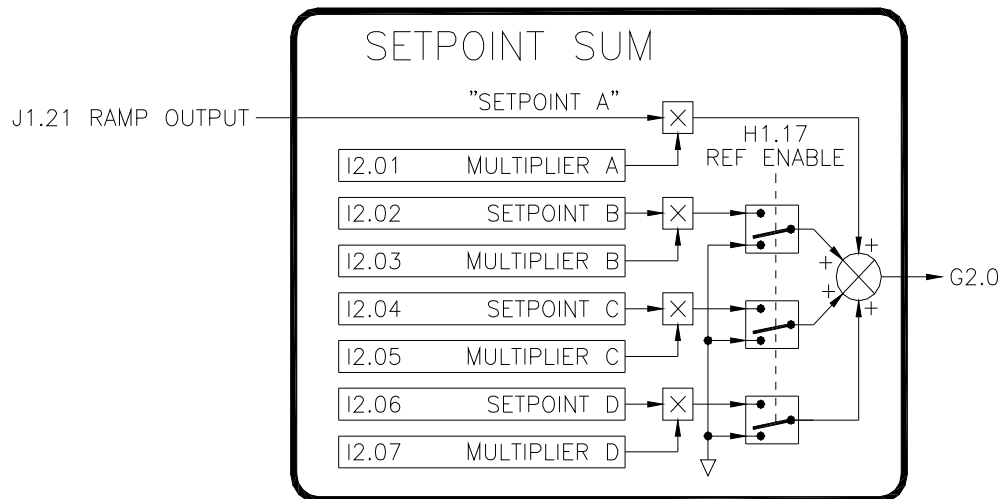


Figure 44

I2.01 Multiplier A (R/W, Preset: 100.00%)

Multiplier for Ramp Output signal. Range: -300..300%

I2.02 Setpoint B (R/W, Preset: 0.00%)

This value is summed with the drive's reference (via the Ramp 1 block). Range: -300..300%

I2.03 Multiplier B (R/W, Preset: 100.00%)

Multiplier for Setpoint B. Range: -300..300%

I2.04 Setpoint C (R/W, Preset: 0.00%)

Refer to I2.02. Range: -300..300%

I2.05 Multiplier C (R/W, Preset: 100.00%)

Refer to I2.03. Range: -300..300%

I2.06 Setpoint D (R/W, Preset: 0.00%)

Refer to I2.02. Range: -300..300%

I2.07 Multiplier D (R/W, Preset: 100.00%)

Refer to I2.03. Range: -300..300%

7.10 J: Ramps

J1: Ramp 1

The Ramp 1 block takes the reference output from the Setpoints block and applies a ramp rate to the signal. The ramped reference is an input to the Setpoint Sum block. Parameters J1.01-J1.04 set the linear acceleration and deceleration times. A positive reference is considered to be in the forward direction and a negative reference is considered to be in the reverse. Parameters J1.05-J1.08 set the "S Curve" characteristics. The ramp block has two sets of ramp parameters designated A and B. Ramp Select (J1.17) is used to select which set is used. In the factory preset configuration, the A set is used in the run mode and the B set is used in the jog mode.

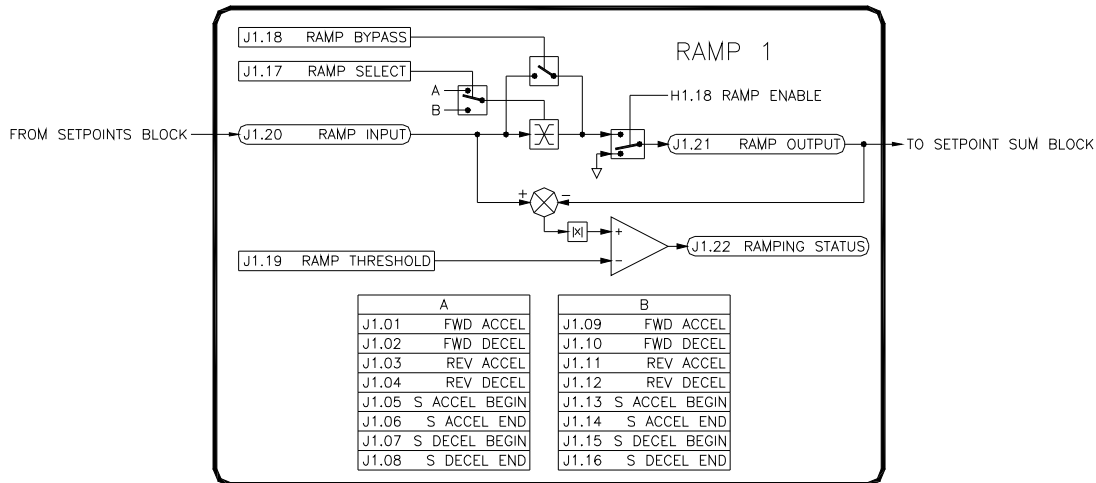


Figure 45

J1.01 Fwd Accel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the reference to increase from 0.00% to +100.00%.
Range: 0.1..600 Secs

J1.02 Fwd Decel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the reference to decrease from +100.00% to 0.00%.
Range: 0.1..600 Secs

J1.03 Rev Accel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the reference to decrease from 0.00% to -100.00%. Valid only for regenerative model drives. Range: 0.1..600 Secs

J1.04 Rev Decel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the reference to decrease from -100.00% to 0.00%. Valid only for regenerative model drives. Range: 0.1..600 Secs

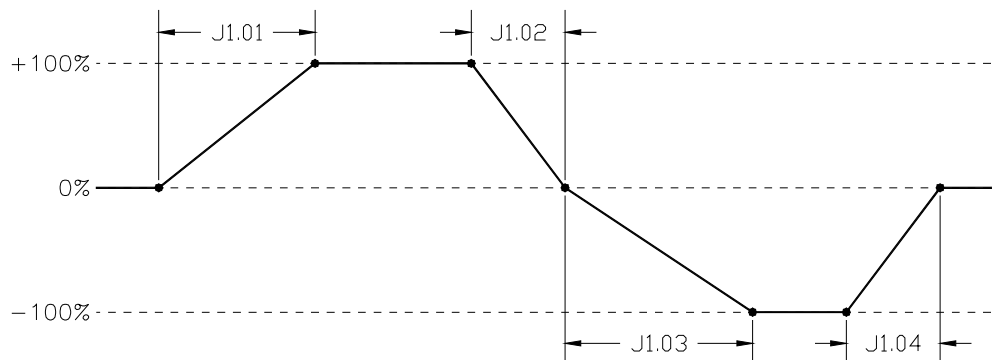


Figure 46

J1.05 S Accel Begin Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the beginning of the acceleration ramp. Range: 0..10 Secs

J1.06 S Accel End Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the ending the acceleration ramp. Range: 0..10 Secs

J1.07 S Decel Begin Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the beginning of the deceleration ramp. Valid only for regenerative model drives. Range: 0..10 Secs

J1.08 S Decel End Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the ending the deceleration ramp. Valid only for regenerative model drives. Range: 0..10 Secs

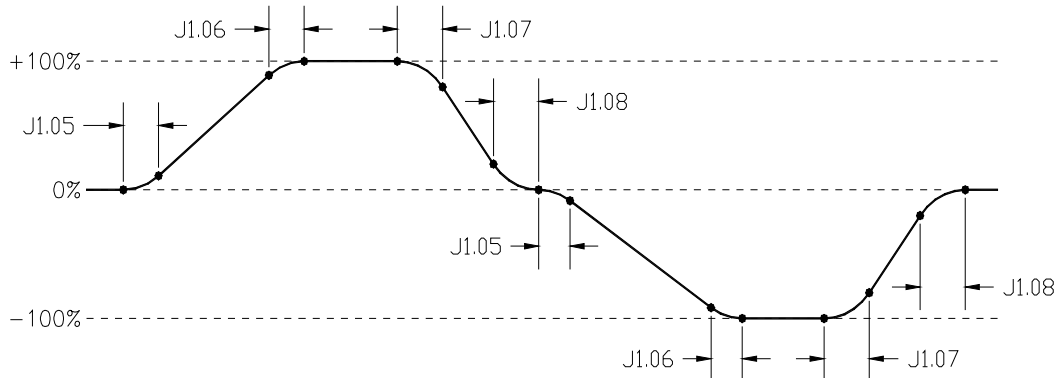


Figure 47

J1.09 Fwd Accel Time B (R/W, Preset: 1.0 Secs)

J1.10 Fwd Decel Time B (R/W, Preset: 1.0 Secs)

J1.11 Rev Accel Time B (R/W, Preset: 1.0 Secs)

J1.12 Rev Decel Time B (R/W, Preset: 1.0 Secs)

J1.13 S Accel Begin Time B (R/W, Preset: 0.0 Secs)

J1.14 S Accel End Time B (R/W, Preset: 0.0 Secs)

J1.15 S Decel Begin Time B (R/W, Preset: 0.0 Secs)

J1.16 S Decel End Time B (R/W, Preset: 0.0 Secs)

Parameters J1.09-J1.16 are used when Ramp Select (J1.17) is set to B. Otherwise, parameters J1.01-J1.08 are used.

J1.17 Ramp Select (R/W, Preset: A)

Determines which ramp parameters are used. When **A** is selected, parameters J1.01-J1.08 are used. When **B** is selected, parameters J1.09-J1.16 are used.

J1.18 Ramp Bypass (R/W, Preset: Off)

When **ON**, the ramp is bypassed and the Ramp Output (J1.21) is equal to the Ramp Input (J1.20).

J1.19 Ramp Threshold (R/W, Preset: 1.00%)

The block compares the input to the output to determine if the ramp is active. The Ramp Threshold sets how much difference between the input and output is required for the ramp to be considered active. Range: 0..100%

J1.20 Ramp Input (RO)

The input to the ramp block. When the drive is running, this parameter will be equal to the reference (I1.10). When stopped or ramping to stop, this parameter will have a value of 0%.

J1.21 Ramp Output (RO)

The output to the block. The Ramp Output (J1.21) will increase or decrease its value until it is equal to the Ramp Input (J1.20). The amount of time for it to change is determined by the Accel/Decel parameters.

J1.22 Ramping Status (RO)

Indicates whether the Ramp Output (J1.21) is increasing or decreasing to the value of the Ramp Input (J1.20).

J2: Ramp 2

The Ramp 2 block is very similar to the Ramp 1 block. It can be used for custom applications.

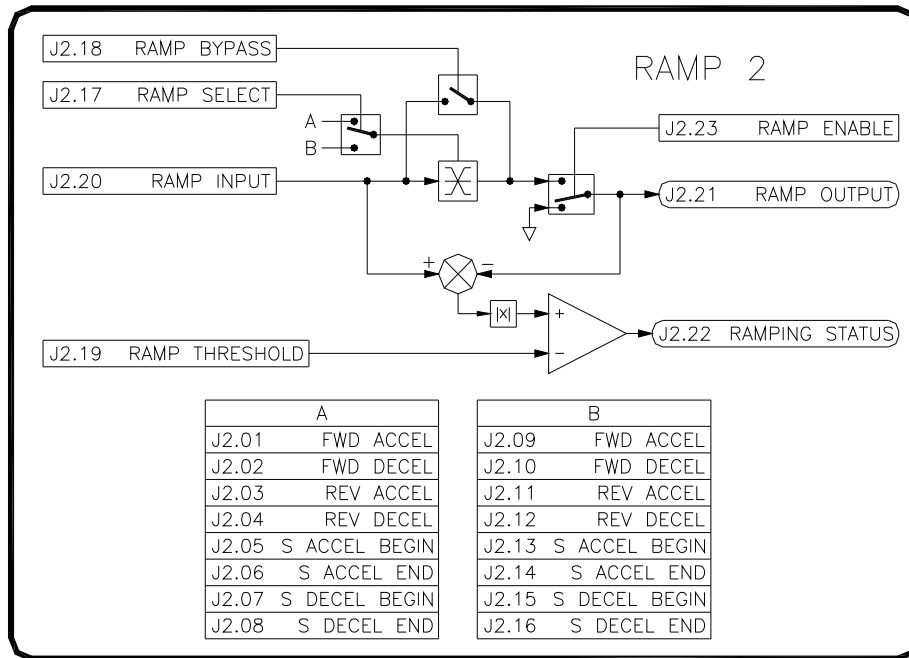


Figure 48

J2.01 Fwd Accel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the ramp output to increase from 0.00% to +100.00%.
Range: 0.1..600 Secs

J2.02 Fwd Decel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the ramp output to decrease from +100.00% to 0.00%.
Range: 0.1..600 Secs

J2.03 Rev Accel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the ramp output to decrease from 0.00% to -100.00%.
Range: 0.1..600 Secs

J2.04 Rev Decel Time A (R/W, Preset: 5.0 Secs)

Defines the time that it takes for the ramp output to decrease from -100.00% to 0.00%.
Range: 0.1..600 Secs

J2.05 S Accel Begin Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the beginning of the acceleration ramp. Range: 0..10 Secs

J2.06 S Accel End Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the ending the acceleration ramp. Range: 0..10 Secs

J2.07 S Decel Begin Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the beginning of the deceleration ramp. Range: 0..10 Secs

J2.08 S Decel End Time A (R/W, Preset: 0.0 Secs)

Defines the S Curve characteristic at the ending the deceleration ramp. Range: 0..10 Secs

J2.09 Fwd Accel Time B (R/W, Preset: 1.0 Secs)

J2.10 Fwd Decel Time B (R/W, Preset: 1.0 Secs)

J2.11 Rev Accel Time B (R/W, Preset: 1.0 Secs)

J2.12 Rev Decel Time B (R/W, Preset: 1.0 Secs)

J2.13 S Accel Begin Time B (R/W, Preset: 0.0 Secs)

J2.14 S Accel End Time B (R/W, Preset: 0.0 Secs)

J2.15 S Decel Begin Time B (R/W, Preset: 0.0 Secs)

J2.16 S Decel End Time B (R/W, Preset: 0.0 Secs)

Parameters J2.09-J2.16 are used when Ramp Select (J2.17) is set to B. Otherwise, parameters J2.01-J2.08 are used.

J2.17 Ramp Select (R/W, Preset: A)

Determines which ramp parameters are used. When **A** is selected, parameters J2.01-J2.08 are used. When **B** is selected, parameters J2.09-J2.16 are used.

J2.18 Ramp Bypass (R/W, Preset: Off)

When **ON**, the ramp is bypassed and the Ramp Output (J2.21) is equal to the Ramp Input (J2.20).

J2.19 Ramp Threshold (R/W, Preset: 1.00%)

The block compares the input to the output to determine if the ramp is active. The Ramp Threshold sets how much difference between the input and output is required for the ramp to be considered active. Range: 0..100%

J2.20 Ramp Input (RO)

The input to the ramp block.

J2.21 Ramp Output (RO)

The output to the block. The Ramp Output (J2.21) will increase or decrease its value until it is equal to the Ramp Input (J2.20). The amount of time for it to change is determined by the Accel/Decel parameters.

J2.22 Ramping Status (RO)

Indicates whether the Ramp Output (J2.21) is increasing or decreasing to the value of the Ramp Input (J2.20).

J2.23 Ramp Enable (RW, Preset: Disable)

Enables/disables the ramp. When enabled, the Ramp Output (J2.21) will increase or decrease its value until it is equal to Ramp Input (J2.20). When disabled, the Ramp Output value holds its current value.

K1: Fault Options

FAULT OPTIONS	
K1.01	FEEDBACK LOSS ENABLE
K1.02	FEEDBACK LOSS LEVEL
K1.03	FIELD LOSS ENABLE
K1.04	FIELD LOSS LEVEL
K1.05	FIELD OV ENABLE
K1.06	FIELD OV LEVEL
K1.07	FIELD OV TIME
K1.08	FIELD OC ENABLE
K1.09	FIELD OC LEVEL
K1.10	FIELD OC TIME
K1.11	ARM I FOLDBACK TIME
K1.12	ARM OC TIME
K1.13	OVERSPEED LEVEL
K1.14	EXTERNAL FAULT
K1.15	EXT FAULT RESET
K1.16	S/W FAULT RESET
K1.17	KEYPAD DETECT ENA
K1.18	PHASE LOSS TIME

Figure 49

K1.01 Feedback Loss Enable (R/W, Preset: Enabled)

Only used if G2.15 is set to **TACHOMETER** or **ENCODER**. In order to prevent excessive speed in a run away condition, the drive has the capability to detect the loss of a speed feedback signal. When detected, the drive will generate a Feedback Loss fault. Setting this parameter to **DISABLED** prevents this fault from occurring.

K1.02 Feedback Loss Level (R/W, Preset: 55.00%)

A feedback loss fault is generated if the conduction angle exceeds this level and the velocity feedback (G2.17) is below 2%.

Range: 0..100%

K1.03 Field Loss Enable (R/W, Preset: Enabled)

When **ENABLED**, the drive will generate a field loss fault if the field current (G3.08) drops below the level set by K1.04.

K1.04 Field Loss Level (R/W, Preset: 2.00%)

Defines the level of field current where a field loss fault is generated. Range: 0..100%

K1.05 Field OV Enable (R/W, Preset: Enabled)

When **ENABLED**, the drive will generate a field over voltage fault if excessive field voltage is detected. The over voltage level is set by K1.06. The amount of time the over voltage condition must be present before the fault is generated is set by K1.07.

K1.06 Field OV Level (R/W, Preset: 110%)

Defines the field over voltage level. The percentage adjustment is based on the motor nameplate base speed field voltage (F1.06). Range: 100..150%

K1.07 Field OV Time (R/W, Preset: 10 Min)

Defines the length of time the field over voltage condition must be present before the field over voltage fault is generated. Range: 1..60 Minutes

K1.08 Field OC Enable (R/W, Preset: Enabled)

When **ENABLED**, the drive will generate a field over current fault if excessive field current is detected. The over current level is set by K1.09. The amount of time the over current condition must be present before the fault is generated is set by K1.10.

K1.09 Field OC Level (R/W, Preset: 110%)

Defines the field over current level. The percentage adjustment is based on the motor nameplate base speed field current (F1.04). Range: 100..150%

K1.10 Field OC Time (R/W, Preset: 10 Min)

Defines the length of time the field over current condition must be present before the field over current fault is generated. Range: 1..60 Minutes

K1.11 Arm Curr Foldback Time (R/W, Preset: 15.0 Secs)

Defines the length of time the drive will allow the armature current to exceed 105% before the foldback alarm is generated. If the current drops below 105%, the timer will reset.

Range: 0..60 Secs

K1.12 Arm OC Time (R/W, Preset: 45.0 Secs)

Defines the length of time the drive will allow the armature current to exceed 105% before an over current fault is generated. If the current drops below 105%, the timer will reset.

Range: 0..240 Secs

K1.13 Motor Overspeed Level (R/W, Preset: 125.00%)

Only used if G2.15 is set to **TACHOMETER** or **ENCODER**. Defines the level of an over speed fault. The percentage adjustment is based on the velocity feedback (G2.17). Range: 0..125%

K1.14 External Fault (R/W, Preset: Off)

Typically a digital input is linked to this parameter. This allows an external signal to generate a drive fault. A value of **ON** generates the fault.

K1.15 External Fault Reset (R/W, Preset: Off)

In the factory preset configuration, digital input 7 is linked to this parameter. When this parameter has a value of **ON**, the drive will attempt to clear any fault that is present.

K1.16 Software Fault Reset (R/W, Preset: Off)

When this parameter has a value of **ON**, the drive will attempt to clear any fault that is present. It's value will automatically return to **OFF**. This parameter is typically used by an external controller via a communications channel.

K1.17 Keypad Disconnect Fault (R/W, Preset: Disabled)

When **ENABLED**, the drive will generate a keypad disconnected fault if/when the keypad is disconnected.

K1.18 Phaes Loss Time (R/W, Preset: 0.055 Secs)

The drive will generate a phase loss fault if an incoming AC phase is missing for this approximate amount of time.

K2: Fault Status

K2.01 Power On Reset (RO)

The drive generates an internal reset by setting this parameter to **ON** after power is applied. After the reset expires, the value returns to **OFF**.

K2.02 Internal Fault Reset (RO)

This parameter is set to **ON** when the RESET button on the keypad is used to clear a fault. Its value automatically returns to **OFF**.

K2.03 Active Faults 1 (RO)

This parameter along with K2.04 indicate which faults are currently active. A '1' indicates the fault is active and a '0' indicates the fault is not active.

FAULT STATUS

K2.01	POWER ON RESET
K2.02	INT FAULT RESET
K2.03	ACTIVE FAULTS 1
K2.04	ACTIVE FAULTS 2
K2.05	LATCHED FAULTS 1
K2.06	LATCHED FAULTS 2
K2.07	FAULT
K2.08	DRIVE FAULTED
K2.09	FIELD FAULT
K2.10	DRIVE READY
K2.11	ACTIVE ALARMS 1
K2.12	ACTIVE ALARMS 2
K2.13	ALARM

Figure 50

EEPROM Write		Field Over Voltage		CT ID Board		Motor Over Speed
EEPROM Read		External Fault		Phase Loss		Armature Over Voltage
Keypad Disconnect		Thermistor Open		Heatsink Over Temp		Feedback Loss
Field Over Current		Undefined		Armature Over Current		Field Loss
0 0 0 0	-	0 0 0 0	-	0 0 0 0	-	0 0 0 0

Table 12: Faults 1

K2.04 Active Faults 2 (RO)

Refer to K2.03.

Undefined		Undefined		Com C Timeout		Hardware A1
Undefined		Undefined		Motor Data		Hardware A0
Undefined		Undefined		Hardware B0		Open Loop Config Fault
Undefined		CN29 Unplugged		Hardware A2		Feedback Config Fault
0 0 0 0	-	0 0 0 0	-	0 0 0 0	-	0 0 0 0

Table 13: Faults 2

K2.05 Latched Faults 1 (RO)

This parameter along with K2.06 indicate which faults have latched. When a fault occurs, it may only be active momentarily. The drive latches faults so that they may be examined before being

cleared. A '1' indicates the fault occurred and is latched. A fault reset will clear the '1' back to a '0' (assuming the fault is no longer active). Refer to Table 12.

K2.06 Latched Faults 2 (RO)

Refer to K2.05. Refer to Table 13.

K2.07 Fault Description (RO)

Indicates the current fault. If multiple faults are latched, the highest priority fault is displayed. Refer to page 111 for a list of faults and their descriptions.

K2.08 Drive Faulted (RO)

YES indicates if the drive is currently faulted.

K2.09 Field Fault (RO)

YES indicates if the drive has a field fault.

K2.10 Drive Ready (RO)

YES indicates the drive is ready to run. The drive is considered ready to run when the Run Enable (H1.12) is in the ENABLED state and Drive Faulted (K2.08) is NO.

K2.11 Active Alarms 1 (RO)

This parameter indicates which alarms are currently active. A '1' indicates the alarm is active and a '0' indicates the alarm is not active.

Undefined		Undefined		Undefined		Field Over Current
Undefined		Undefined		Undefined		Field Over Voltage
Undefined		Undefined		Undefined		Foldback
Undefined		Undefined		Com C Timeout		EEPROM Write
0 0 0 0	-	0 0 0 0	-	0 0 0 0	-	0 0 0 0

Table 14: Alarms 1

K2.13 Active Description (RO)

Indicates the current alarm. If multiple alarms are present, the highest priority alarm is displayed.

K3: Fault Log

K3.01 Most Recent Fault (RO)

K3.02 2nd Most Recent Fault (RO)

K3.03 3rd Most Recent Fault (RO)

K3.04 4th Most Recent Fault (RO)

K3.05 5th Most Recent Fault (RO)

K3.06 6th Most Recent Fault (RO)

K3.07 7th Most Recent Fault (RO)

K3.08 8th Most Recent Fault (RO)

K3.09 9th Most Recent Fault (RO)

K3.10 10th Most Recent Fault (RO)

The fault log keeps track of the last 10 faults. The newest fault is stored in K3.01. The oldest fault is stored in K3.10.

K3.11 Clear Fault Log (R/W, Preset: No)

Clears K3.01-K3.10 to 'NONE' when set to **YES**. The value automatically returns to **NO**.

FAULT LOG		
K3.01	MOST RECENT	FAULT
K3.02	2ND MOST RECENT	FAULT
K3.03	3RD MOST RECENT	FAULT
K3.04	4TH MOST RECENT	FAULT
K3.05	5TH MOST RECENT	FAULT
K3.06	6TH MOST RECENT	FAULT
K3.07	7TH MOST RECENT	FAULT
K3.08	8TH MOST RECENT	FAULT
K3.09	9TH MOST RECENT	FAULT
K3.10	10TH MOST RECENT	FAULT
K3.11	CLEAR FAULT LOG	

Figure 51

K4: Fault Capture

The fault capture block captures the values of certain operating parameters when a fault occurs. The captured values can be used as a troubleshooting/diagnostic aid in determining the cause of the fault.

K4.01 Fault (RO)

A description of the fault.

K4.02 Armature Volts (RO)

The armature voltage level (G2.08) when the fault occurred.

K4.03 Armature Amps (RO)

The armature current level (G1.14) when the fault occurred.

K4.04 Field Volts (RO)

The field voltage level (G3.14) when the fault occurred.

K4.05 Field Amps (RO)

The field current level (G3.10) when the fault occurred.

K4.06 Reference (RO)

The reference level (I1.10) when the fault occurred.

K4.07 Ramp Output (RO)

The ramp output level (J1.21) when the fault occurred.

K4.08 Final Vel Demand (RO)

The final velocity demand level (G2.04) when the fault occurred.

K4.09 Velocity Feedback (RO)

The velocity feedback level (G2.17) when the fault occurred.

K4.10 Final Current Demand (RO)

The final armature current demand level (G1.08) when the fault occurred.

K4.11 Arm Current Feedback (RO)

The armature current feedback level (G1.12) when the fault occurred.

K4.12 Armature Conduction (RO)

The armature conduction level (G1.20) when the fault occurred.

K4.13 Final Field Current Demand (RO)

The final field current demand level (G3.17) when the fault occurred.

K4.14 Field Current Feedback (RO)

The field current feedback level (G3.08) when the fault occurred.

K4.15 Field Conduction (RO)

The field conduction level (G3.27) when the fault occurred.

K4.16 Drive Mode (RO)

The drive mode (H1.20) when the fault occurred.

K4.17 Clear Fault Capture (R/W, Preset: No)

When set to **YES**, clears parameters K4.01-K4.17. The value automatically resets to **NO**.

FAULT CAPTURE

K4.01	FAULT
K4.02	ARMATURE VOLTS
K4.03	ARMATURE AMPS
K4.04	FIELD VOLTS
K4.05	FIELD AMPS
K4.06	REFERENCE
K4.07	RAMP OUTPUT
K4.08	FINAL VELOCITY DEMAND
K4.09	VELOCITY FEEDBACK
K4.10	FINAL ARM CURRENT DEMAND
K4.11	ARM CURRENT FEEDBACK
K4.12	ARMATURE CONDUCTION
K4.13	FINAL FIELD CURRENT DEMAND
K4.14	FIELD CURRENT FEEDBACK
K4.15	FIELD CONDUCTION
K4.16	DRIVE MODE
K4.17	CLEAR FAULT CAPTURE

Figure 52

7.12 L: Applications

L1: Aux PID Loop

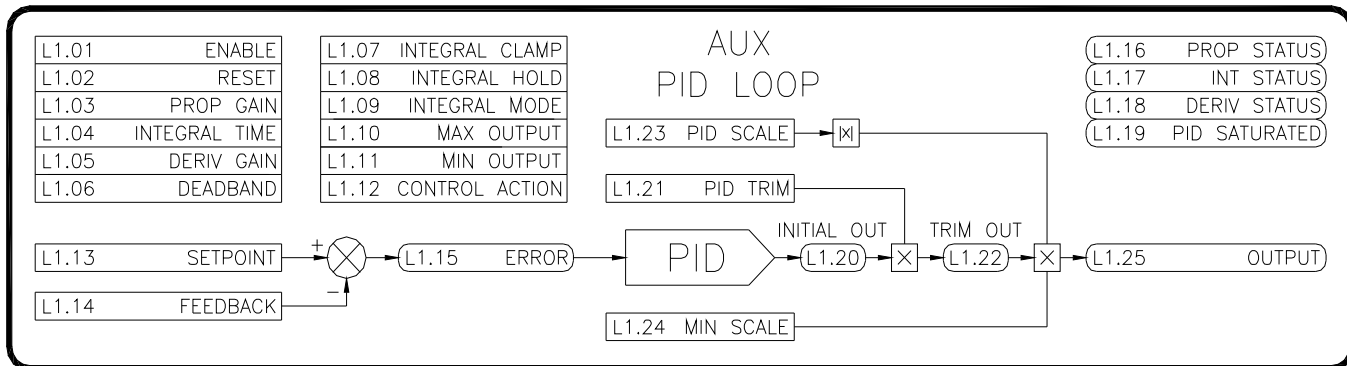


Figure 53

L1.01 PID Enable (R/W, Preset: Disabled)

Enables/disables the PID loop. The output (L1.25) is held at zero when **DISABLED**.

L1.02 PID Reset (R/W, Preset: Off)

Resets the PID loop. The output (L1.25) is held at zero when **ON**.

L1.03 Prop Gain (R/W, Preset: 5.00)

Sets the loop response. Increasing the gain improves the loop response but can also increase overshoot. Range: 0..100

L1.04 Integral Time (R/W, Preset: 10.000 Secs)

Sets the loop response. Decreasing the integral time improves the loop response. Setting it too low can cause oscillations. Range: 0.01..60 Secs

L1.05 Derivative Gain (R/W, Preset: 0.00)

Sets the loop response. Increasing the gain improves the response. Setting it too high can cause oscillations. Range: 0..600

L1.06 Deadband (R/W, Preset: 0.00%)

This adjustment is used to provide a window of tolerance in the error signal that the integral circuit will ignore. This is commonly used to ignore small dancer movements. Range: 0-30%

L1.07 Integral Clamp (R/W, Preset: Off)

When **ON**, the integral signal is clamped to zero in the PID loop, yielding proportional-derivative control only.

L1.08 Integral Hold (R/W, Preset: Off)

When **ON**, the integral signal is held at its current level.

L1.09 Integral Mode (R/W, Preset: Linear)

When set to **LINEAR**, the integral signal changes at a linear rate. It is not dependent on the magnitude of the error signal. When set to **CLASSICAL**, the integral signal is dependent on the magnitude of the error signal.

L1.10 Max Output (R/W, Preset: 100.00%)

Defines the upper limit for the initial PID output. Range: 0..+100%

L1.11 Min Output (R/W, Preset: 100.00%)

Defines the lower limit for the initial PID output. Range: -100..0%

L1.12 Controller Action (R/W, Preset: ERR=SP-FB)

Determines how the error is calculated. The error is the difference between the Setpoint and Feedback parameters. This effectively determines the direction of correction that the PID loop provides. Available options are ERR=SP-FB or ERR=FB-SP.

L1.13 Setpoint (R/W, Preset: 0.00%)

The desired position on dancer systems or the desired tension on loadcell systems.

Range:0..100%

L1.14 Feedback (R/W, Preset: 0.00%)

The dancer feedback signal or loadcell feedback signal. This signal will typically come from one of the Analog Inputs. Range:0..100%

L1.15 Error (RO)

The difference between the Setpoint (L1.12) and the Feedback (L1.13) signals. The sign of the error is determined by Controller Action (L1.12).

L1.16 Prop Status (RO)

The individual proportional component of the PID Loop. This parameter is provided for aid in setup and tuning.

L1.17 Integral Status (RO)

The individual integral component of the PID Loop. This parameter is provided for aid in setup and tuning.

L1.18 Deriv Status (RO)

The individual derivative component of the PID Loop. This parameter is provided for aid in setup and tuning.

L1.19 PID Saturation Status (RO)

When ON, the PID output signal has saturated. This may indicate that the PID Trim (L1.21) may need to be increased. This parameter is provided for aid in setup and tuning.

L1.20 Initial Output (RO)

The initial output of the PID loop. This value is the sum of parameters L1.16-L1.18. Parameters L1.10 and L1.11 also limit this value.

L1.21 PID Trim (R/W, Preset: 10.00%)

A scale that is applied to L1.20 that produces L1.22. Typically this adjustment is used to reduce the operating range of the loop. Range:-100..100%

L1.22 Trim Output (RO)

The result of the Initial Output (L1.20) scaled by the PID Trim (L1.21).

L1.23 PID Scale (R/W, Preset: 100.00%)

In some applications, it is advantageous to scale the PID output to an external signal (such as line speed). This allows the loop to provide less correction at low speeds and more correction at higher speeds. When used, an external signal is typically linked to this parameter.

Range:-100..100%

L1.24 PID Min Scale (R/W, Preset: 10.00%)

Used in conjunction with L1.23. When an external signal is used to scale the PID output (see L1.23), it may be desirable to set a minimum scaling limit. This ensures the loop will always be able to provide an output even if PID Scale (L1.23) is zero. Range:0..100%

L1.25 PID Output (RO)

The final output of the PID loop. Typically, this value is linked to another parameter in the drive via an internal link.

L2: Diameter Calculator

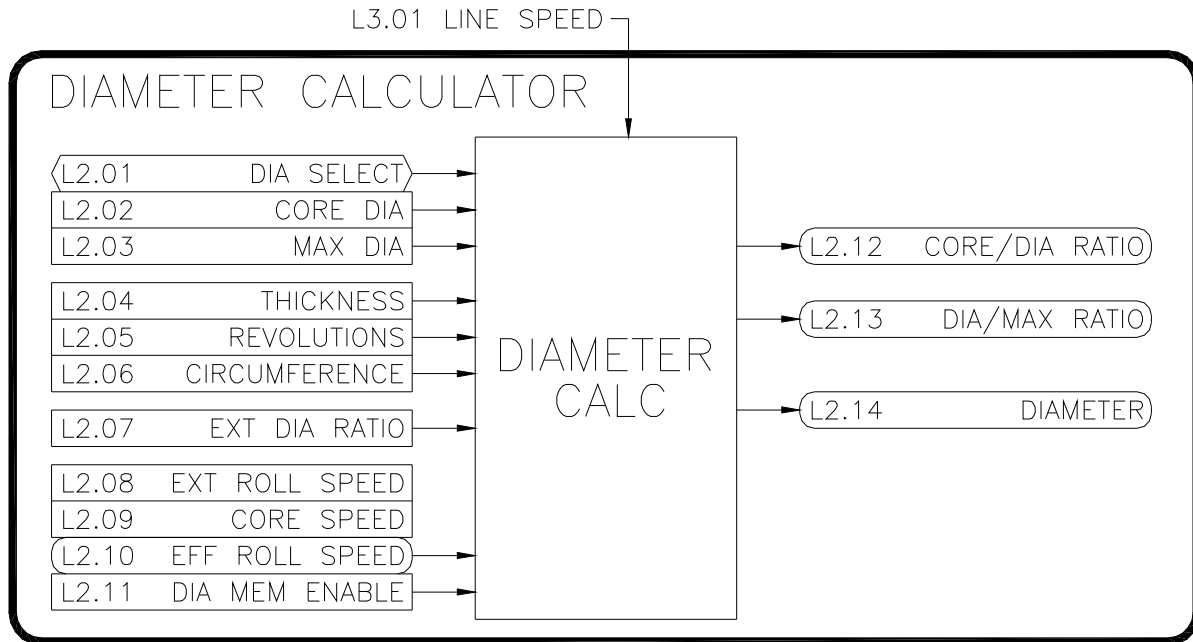


Figure 54

L2.01 Diameter Select (R/W, Preset: None)

Selects the method of diameter calculation.

NONE

The diameter calculator is disabled.

EXTERNAL

An external device measures the diameter (such as a sonic or a laser). The external device is connected to an analog or freq input. The input is linked to the External Diameter Ratio (L2.07).

ROLL REVOLUTIONS

An external sensor (proximity or encoder) is used to send a pulse train to the frequency input. The counter function is used to keep track of the number of winder/unwinder roll revolutions. This count is linked to L2.05. This count along with the Material Thickness (L2.04) is used to calculate the diameter.

LINE REVOLUTIONS

Similar to the ROLL REVOLUTIONS selection above. However, the sensor producing the pulse train is located on a line roller instead of the winder/unwinder roll. The Circumference (L2.06) of the line roller is also required along with the Material Thickness (L2.04) to calculate the diameter.

LINE/ROLL

This method uses Line Speed (L3.01) along with the Roll Speed (L2.08) to calculate the diameter. This method is only recommended for use when the drive is operating in the torque mode (A1.02).

L2.02 Core Diameter (R/W, Preset: 1.00")

Defines the minimum core diameter. Typically, if multiple size cores are used, the smallest size should be entered. Range: 0.01..600"

L2.03 Max Diameter (R/W, Preset: 10.00")

Defines the maximum roll diameter. Typically, if multiple sizes are used, the largest size should be entered. Range: 0.01..600"

L2.04 Thickness (R/W, Preset: 0.0001")

Used only when L2.01 is set to **ROLL REVOLUTIONS** or **LINE REVOLUTIONS**.

The actual thickness of the material being used should be entered here. If a range of material thicknesses are used, an average of the thickness should be used. Alternatively, an external controller (such as an HMI) could be used to change this value for different products.

Range: 0.0001..6"

L2.05 Revolutions (R/W, Preset: 0)

Used only when L2.01 is set to **ROLL REVOLUTIONS** or **LINE REVOLUTIONS**. Typically, either the frequency or encoder input blocks are linked to this parameter. For each revolution of the roll, this count should increase or decrease by 1. Range: 0..65535

L2.06 Circumference (R/W, Preset: 0.01")

Used only when L2.01 is set to **LINE REVOLUTIONS**. The circumference of the line roller that is producing the pulse train should be entered here. This parameter informs the diameter calculator how much material is added to or removed from the roll in one revolution. Range: 0..300"

L2.07 External Diameter (R/W, Preset: 0.00%)

Used only when L2.01 is set to **EXTERNAL**. Typically, an analog or frequency input is linked to this parameter. This signal should be scaled so a value of 0.00% represents an empty core (L2.02), and a value of 100% represents maximum diameter (L2.03). Range: 0..100%

L2.08 External Roll Speed (R/W, Preset: 0.00%)

Typically, the Filtered Velocity Feedback (G2.18) or Roll Speed (L3.04) is linked to this parameter. This value informs the diameter calculator of the speed of the winder/unwinder roll. Range: -100..100%

L2.09 Core Speed (R/W, Preset: 100.00%)

This parameter defines the maximum level of L2.08. The maximum level is typically obtained when an empty core is loaded and speed matched to the line that is running at maximum desired speed. Range: 0..100%

L2.10 Effective Roll Speed (RO)

L2.08 and L2.09 are used to calculate this value. It should have a value of 0% when the roll is stopped, and a value of 100% when an empty core is speed matched to the line. This value is used by the CTCW block to calculate friction compensation.

L2.11 Diameter Memory (R/W, Preset: Disabled)

Used only when L2.01 is set to **LINE/ROLL**. A diameter memory function is provided to maintain speed based diameter levels during stop (when the Line Speed and External Roll Speed signals are at 0.00%). When **ENABLED**, memory function does not allow the Diameter signal to decrease in value. When **DISABLED**, the memory circuit is not used and the calculated diameter is based on the current Line Speed and Roll Speed values.

L2.12 Core/Dia Ratio (RO)

The ratio of the core diameter (L2.02) to the calculated diameter (L2.14).

L2.13 Dia/Max Ratio (RO)

The ratio of the calculated diameter (L2.14) to the maximum diameter (L2.03).

L2.14 Diameter (RO)

The calculated roll diameter.

L3: Roll Speed Calculator

A problem encountered in center driven takeup and letoff applications is the nonlinear relationship between the diameter of a roll and the motor speed required to maintain constant surface speed of the roll during diameter increase or decrease. A plot of this relationship shows a hyperbolic curve. Refer to Figure 57. When the line speed and roll diameter values are known, the required roll speed can be calculated. The rate of material take-up or pay-out from a center driven winder or unwinder would be held constant during roll diameter changes. The line speed signal typically comes from a tachometer, encoder, or an output from the line drive. The diameter information can be obtained through a number of different methods (see L2.01). The scaled line speed is divided by the scaled diameter signal to generate the center drive speed reference. Depending on required system response, a dancer or other device may be required for limited transient compensation between the center winder/unwinder and other driven parts of a line.

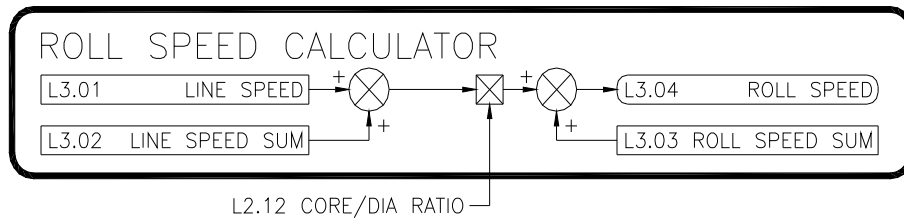


Figure 56

L3.01 Line Speed (R/W, Preset: 0.00%)

Represents the speed of the line. Typically, an analog or frequency input is linked to this parameter. The external signal should be scaled so that 0% represents stop and 100% represents maximum desired speed. Range: -100..100%

L3.02 Line Speed Sum (R/W, Preset: 0.00%)

This setting allows for a signal to be summed before the Core/Diameter Ratio (L2.12) is applied. In some engineered applications involving dancers or loadcells, the PID loop output is summed here. Range: -100..100%

L3.03 Roll Speed Sum (R/W, Preset: 0.00%)

This setting allows for a signal to be summed after the Core/Diameter Ratio (L2.12) is applied. In some engineered applications involving dancers or loadcells, the PID loop output is summed here. Range: -100..100%

L3.04 Roll Speed (RO)

This is the calculated center driven speed for the winder/unwinder roll.

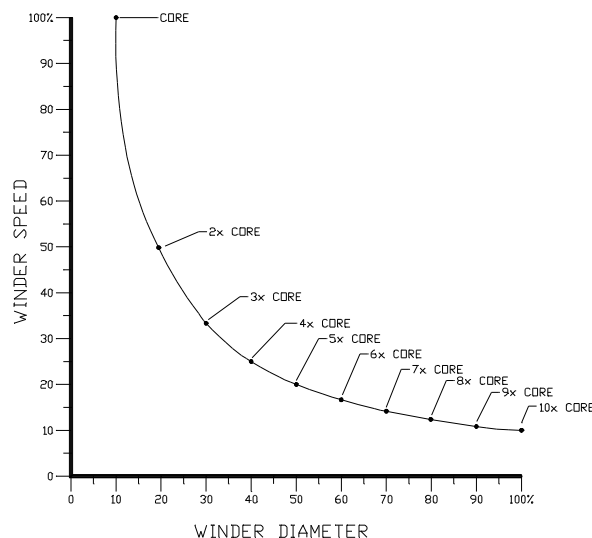


Figure 57

L4: Taper Tension Calculator

When center winding material, in some cases decreasing tension (taper tension) is desirable to prevent telescoping and/or wrinkling of inner layers of material. The taper tension calculator can be configured to provide tapering tension starting at any point in the roll diameter. Tension Demand (L4.04) will decrease by a percentage of the Tension Setpoint (L4.01) from the Taper Diameter (L4.02) setting to the Max Diameter (L2.03).

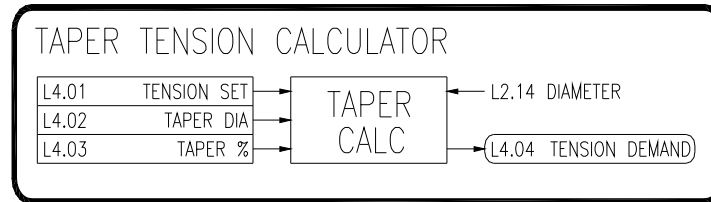


Figure 58

L4.01 Tension Setpoint (R/W, Preset: 0.00%)

The desired tension level. Range: 0..100%

L4.02 Taper Diameter (R/W, Preset: 600.00")

The diameter level at which tapering begins. Range: 0.01..600"

L4.03 Percent Taper (R/W, Preset: 0.00%)

Defines how much the tension demand is tapered (reduced). The amount of taper is a percentage of the setpoint. Refer to Figure 59. In this example, the Tension Setpoint (L4.01) is set to 100.00% and the Percent Taper (L4.03) is 20.00%. Thus, at maximum diameter, Tension Demand (L4.04) has decreased by 20% to 80%. If the Tension Setpoint is reduced to 50% and the other settings are unchanged, this results in a 10% taper. The 10.00% reduction is a decrease of 20% of the tension setpoint (i.e. 20% of 50 is 10%). Range: 0..100%

L4.04 Tension Demand (RO)

The tapered tension demand.

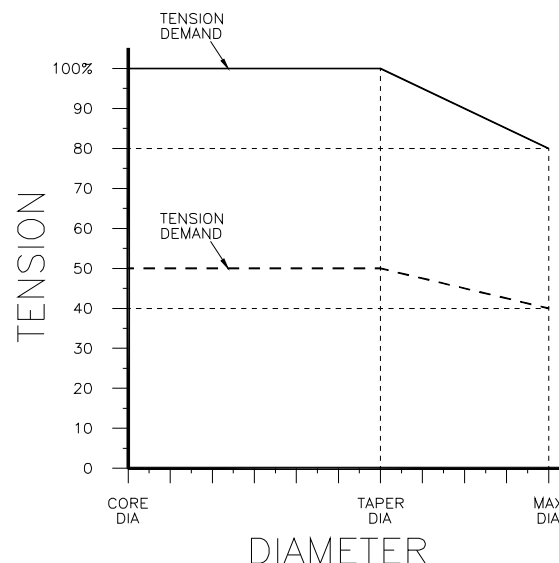


Figure 59

L5: CTCW Calculator

The CTCW (Constant Tension Center Wind) block allows the drive to provide constant or taper tension control without external tension sensors. The CTCW block provides a torque reference output that is composed of diameter torque, inertia torque, friction torque, static friction torque, and pulse torque. Diameter torque is supplied to compensate for the increase in roll diameter. Inertia torque is supplied when the line is accelerating. Friction torque must also be supplied to overcome the mechanics in the drive train. A momentary pulse of torque (pulse torque) can be supplied to help 'break away' the mechanics of the system.

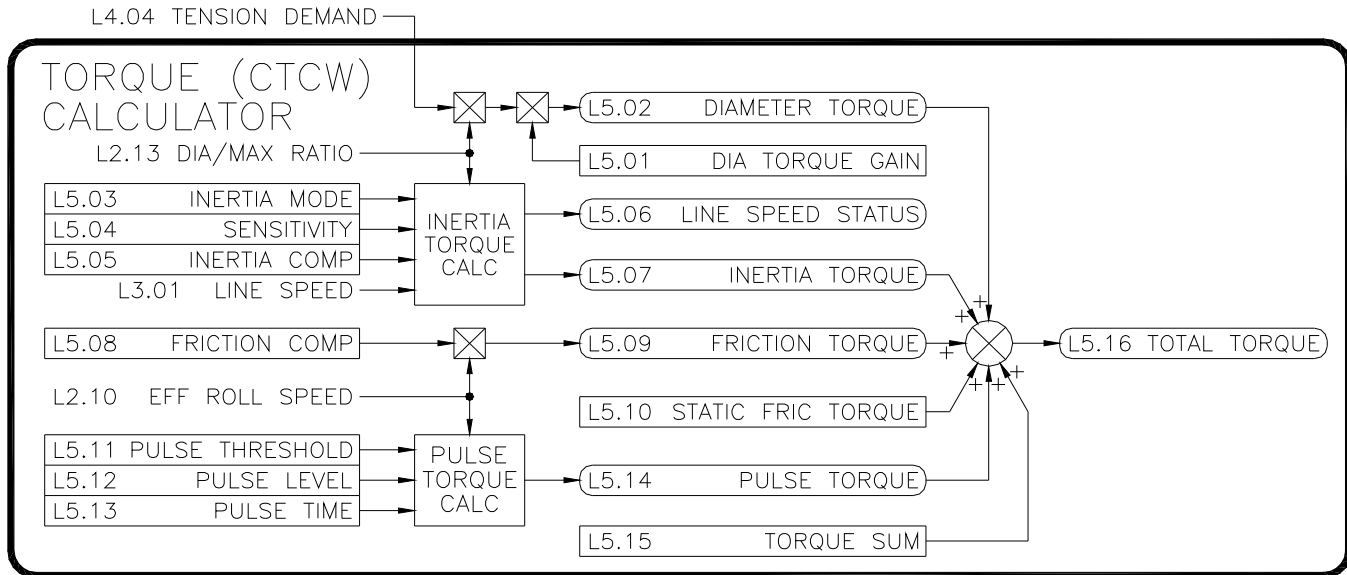


Figure 60

L5.01 Diameter Torque Gain (R/W, Preset: 100.00%)

This parameter provides a gain adjustment for the Diameter Torque (L5.02). Typically, the maximum amount of torque that the motor (and gearing) can provide is greater than the actual amount of torque required to provide the desired tension level at the maximum diameter. This trim adjustment provides a means to scale the Diameter Torque level so that a Tension Demand (L4.04) level of 100% provides only the required torque level to achieve 100% tension. Range: 0..300%

L5.02 Diameter Torque (RO)

In order to provide constant tension, the winder torque must increase proportionally to the increase in diameter. This signal is produced with input from the Diameter Calculator and the Taper Tension Calculator.

L5.03 Inertial Mode (R/W, Preset: Accel)

Controls the type of inertia compensating torque supplied. Typically, winders (takeups) need **ACCEL** compensation and unwinders (letoffs) need **DECCEL** compensation.

L5.04 Inertial Sensitivity (R/W, Preset: 5)

The Inertia Torque calculator monitors the Line Speed (L3.01) parameter to provide an Inertia Torque (L5.07) compensation. The level of compensation depends upon how fast the line speed is changing. This derivative calculation is made by examining the Line Speed at a set interval and determining the amount of change. The sensitivity adjustment controls the amount of time between samples. With fast line acceleration/deceleration rates of a few seconds, the sampling time can be set at 1 or 2. With slower accel/decel rates, the time between samples typically

would need to be increased. Refer to the following table for recommended initial values depending upon the line accel/decel rates. Note that these values may need to be adjusted to obtain steady levels of Inertia Torque depending upon the amount of electrical noise present on the signal. Range: 1..10

Line Speed Accel/Decel Times	Recommended L5.04 Value
1-3	1
4-7	2
8-11	3
12-13	4
14-20	5
21-26	6
27 or higher	7

Table 15: Inertia Sensitivity

L5.05 Inertia Compensation (R/W, Preset: 5)

Additional torque is required by the winder drive when the line speed is accelerating. This parameter is used in conjunction with Line Speed (L3.01) to control the amount of additional Inertia Torque (L5.07). Range: 0..100%

L5.06 Line Speed Status (RO)

This parameter that displays the status of the Line Speed (L3.01): **DECELERATING**, **AT SPEED**, or **ACCELERATING**.

L5.07 Inertia Torque (RO)

The amount of additional torque reference supplied when the line is accelerating or decelerating. Parameters L5.03-L5.05 and L3.01 affect this level.

L5.08 Friction Comp (R/W, Preset: 0.00%)

This parameter is multiplied by the winder roll speed to produce the Friction Torque level (L5.09). Range: 0..100%

L5.09 Friction Torque (RO)

Torque is required to overcome the friction in the mechanics of the drive train. The torque required is proportional to the winder roll speed.

L5.10 Static Friction Comp (R/W, Preset: 0.00%)

This parameter provides a minimum (or bias) starting torque level. Range: 0..100%

L5.11 Pulse Threshold (R/W, Preset: 0.00%)

The level that the Line Speed (L3.01) signal must exceed before pulse torque is supplied. After the pulse torque has been applied, the Line Speed signal must return to 0.00% and again exceed the threshold for pulse torque to be reapplied.

Range: 0..100%

L5.12 Pulse Level (R/W, Preset: 0.00%)

When the mechanics of a system are oversized for the desired level of tension, the friction of the system while stopped many need to be overcome with additional starting torque. This additional torque is only needed momentarily to 'break away' the mechanics of the system. This parameters sets the level of torque to be momentarily applied. Range: 0..100%

L5.13 Pulse Time (R/W, Preset: 0.5 Secs)

The amount of time that the pulse torque signal is applied. Range: 0.1..10 Secs

L5.14 Pulse Torque (RO)

When the Line Speed (L3.01) exceeds L5.11, the level of L5.12 is applied to L5.14 for the time set by L5.13. After the time expires, L5.14 returns to zero. The line speed must return to 0% and exceed the L5.11 value again for the pulse torque to be re-applied.

L5.15 Torque Sum (R/W, Preset: 0.00%)

This parameter provides an auxiliary summing point before the Total Torque is calculated. A typical use would be to sum in a correction signal from the output of a PID block when loadcells are used with the CTCW Calculator. Range: 0..100%

L5.16 Total Torque (RO)

The sum of the L5.02, L5.07, L5.09, L5.10, L5.14 & L5.15. This parameter is typically used as the reference if the drive is in the torque mode. If the drive is in the velocity mode, it is often used as a current limit.

L6: MOP (Motor Operated Potentiometer)

In many industrial applications, a potentiometer is used to provide a reference signal (typically speed) to a machine. Often, it would be advantageous to allow the machine operator to adjust this potentiometer from multiple locations (especially on large machines). However, this is not possible with a standard analog potentiometer. In the past, to overcome this limitation, a potentiometer was mechanically connected to a motor shaft. INCREASE and DECREASE buttons could then be used to slowly rotate the motor one direction or the other, thus changing the output signal from the potentiometer. Multiple buttons could be wired in parallel, allowing INCREASE and DECREASE adjustment in multiple locations. This setup was called a Motor Operated Potentiometer (MOP). The drive has an electronic MOP block that performs this function.

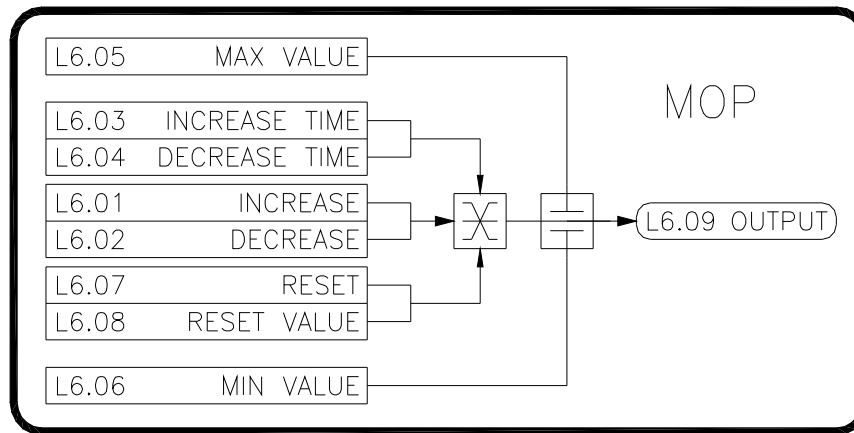


Figure 61

L6.01 MOP Increase (R/W, Preset: Off)

When **ON**, L6.09 increases at the rate defined by L6.03 up to a maximum value of L6.05. When **OFF**, L6.09 stops increasing and holds its value.

L6.02 MOP Decrease (R/W, Preset: Off)

When **ON**, L6.09 decreases at the rate defined by L6.04 down to a minimum value of L6.06. When **OFF**, L6.09 stops decreasing and holds its value.

L6.03 Increase Time (R/W, Preset: 10.0 Secs)

Defines the time it takes for L6.09 to make a 100% change. Range: 0.1..600 Secs

L6.04 Decrease Time (R/W, Preset: 10.0 Secs)

Defines the time it takes for L6.09 to make a 100% change. Range: 0.1..600 Secs

L6.05 MOP Max Value (R/W, Preset: 100.00%)

Defines the upper limit for L6.09. Range: -300..300%

L6.06 MOP Min Value (R/W, Preset: 100.00%)

Defines the lower limit for L6.09. Range: -300..300%

L6.07 MOP Reset (R/W, Preset: Off)

When **ON**, L6.09 will have the value of L6.08.

L6.08 Reset Value (R/W, Preset: Off)

Defines the value that L6.09 has when L6.07 is **ON**. Range: -300..300%

L6.09 MOP Output (R/O)

The output of the MOP block.

L7: Torque Taper Calculator

The Torque Taper Calculator provides a means for the drive to handle simple winder applications with maximum build ratios (max/core) of around 2 to 2.5. A torque taper winder can be realized without using any additional external sensors that would typically be required with a more complex setup.

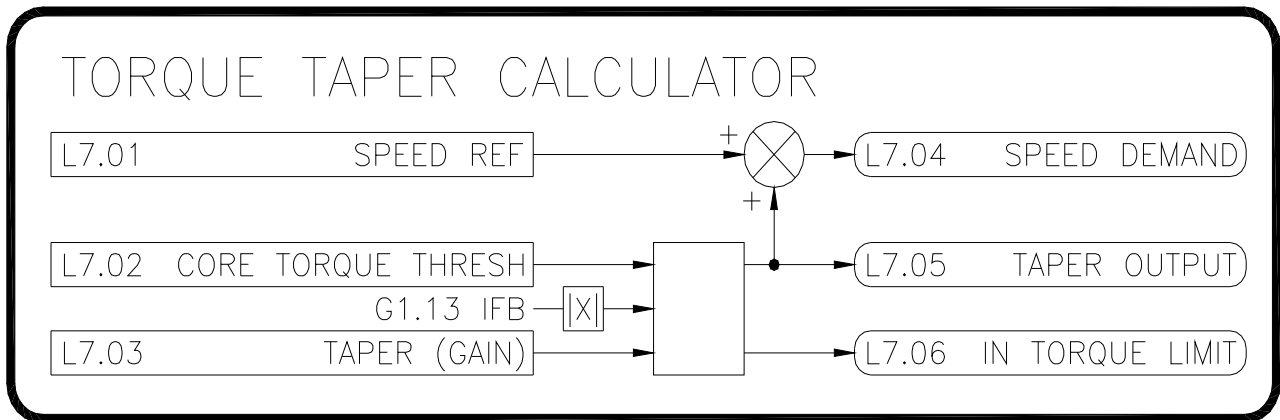


Figure 62

L7.01 Taper Speed Reference (R/W, Preset: 0.00%)

Represents the speed of the line. Typically, an analog or frequency input is linked to this parameter. The external signal should be scaled so that 0% represents stop and 100% represents maximum desired speed. Range: -100..100%

L7.02 Core Torque Threshold (R/W, Preset: 300.00%)

Sets the core diameter torque level. Increase this value to increase material tension at core. Range: 0..300%

L7.03 Taper (Gain) (R/W, Preset: 0.00)

Sets the amount of taper (reduction in torque) as the roll builds. Increase this value to reduce the tension at max diameter. Range: 0..300

L7.04 Taper Speed Demand (R/O)

The resulting speed demand signal. Typically, this parameter is linked to one of the speed references. Range: -100..100%

L7.05 Taper Output (R/O)

The output taper level. This value is subtracted from the Speed Reference (L7.01) to produce the Speed Demand (L7.04).

L7.06 In Torque Limit (R/O)

This status output shows when the unit is limiting torque (i.e. when the armature current (G1.13) is greater than the Core Torque Threshold (L7.02).

7.13 M: Thresholds

The threshold blocks compare an input value to two threshold levels. When the input value equals or exceeds the On Level, an internal switch is turned on. When the input equals or falls below the Off Level, the switch turns off. Two threshold levels are provided so that a hysteresis may be created if desired. The switch has two inputs and one output.

M1: Threshold 1

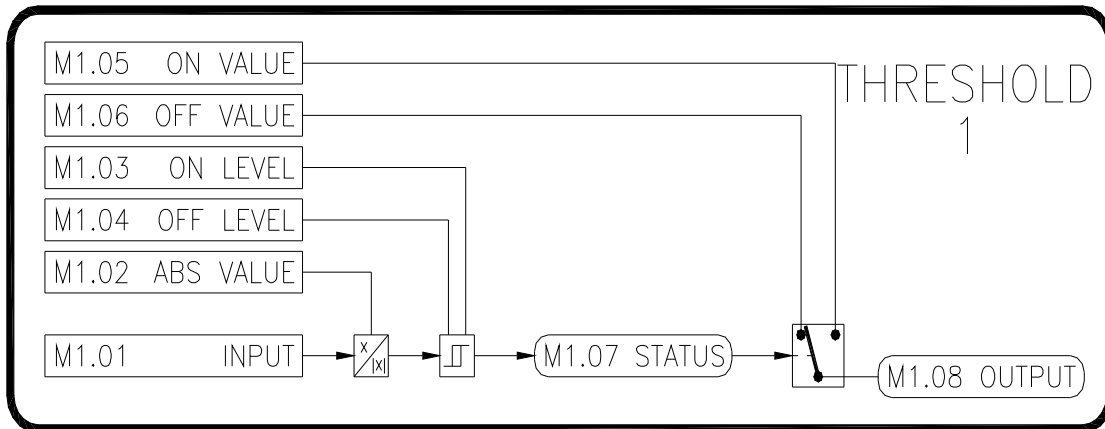


Figure 63

M1.01 Threshold 1 Input (R/W, Preset: 0.00%)

The value of the internal parameter that serves as the control for the switch. An input or internal link must be used to connect the desired parameter to this input. Range: -300..300%

M1.02 Threshold 1 Abs Value (R/W, Preset: Off)

When **ON**, the absolute value of M1.01 is taken before the comparison to the thresholds.

M1.03 Threshold 1 On Level (R/W, Preset: 50.00%)

When M1.01 equals or exceeds this level, the switch is on. Range: -300..300%

M1.04 Threshold 1 Off Level (R/W, Preset: 40.00%)

When M1.01 equals or falls below this level, the switch is off. Range: -300..300%

M1.05 Threshold 1 On Val (R/W, Preset: 100.00%)

The ON input to the switch. The value is selected when the switch is on. Range: -300..300%

M1.06 Threshold 1 Off Val (R/W, Preset: 0.00%)

The OFF input to the switch. The value is selected when the switch is off. Range: -300..300%

M1.07 Threshold 1 Status (RO)

Displays the status of the threshold switch, either **ON** or **OFF**.

M1.08 Threshold 1 Output (RO)

The output of the threshold block. This parameter will equal M1.05 when the switch is on. It will equal M1.06 when the switch is off.

M2: Threshold 2

M3: Threshold 3

M4: Threshold 4

M5: Threshold 5

M6: Threshold 6

Thresholds 2-6 are functionally identical to Threshold 1. Refer to M1.XX.

M7: Threshold 7 (Latch)

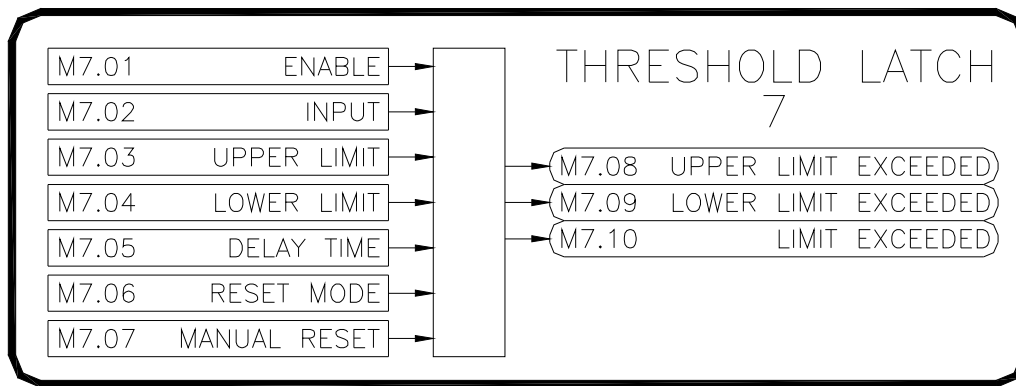


Figure 64

M7.01 Enable (R/W, Preset: Disabled)

Enables/disables the latch. When disabled, all three of the Limit Exceeded outputs are OFF.

M7.02 Input (R/W, Preset: 0.00%)

The input to the latch. This value is compared to the Upper Limit and Lower Limit values. When the input exceeds the Upper Limit for a defined time period, the Upper Limit Exceeded output becomes ON. When the input exceeds the Lower Limit for a defined time period, the Lower Limit Exceeded output becomes ON. Range: -300..300%

M7.03 Upper Limit (R/W, Preset: 90.00%)

The latches upper limit. Range: -300..300%

M7.04 Lower Limit (R/W, Preset: 10.00%)

The latches lower limit. Range: -300..300%

M7.05 Delay Time (R/W, Preset: 0.0Secs)

The amount of time the input must exceed either the Upper or Lower Limits before the Upper Limit Exceeded or Lower Limit Exceeded outputs change to ON. Range: 0..60 Secs

M7.06 Reset Mode (R/W, Preset: Manual)

When in Manual, the Upper Limit Exceeded and/or Lower Limit Exceeded outputs will latch and remain in the ON state. The outputs are reset to OFF when Manual Reset is momentarily set to ON. When in Automatic, the outputs automatically change from ON to OFF when the input signal is below the Upper Limit and above the Lower Limit.

M7.07 Manual Reset (R/W, Preset: Off)

Used only when Reset Mode is set to Manual.

M7.08 Upper Limit Exceeded (R/O)

Indicates the Input signal has exceeded the Upper Limit for the time defined by Delay Time.

M7.09 Lower Limit Exceeded (R/O)

Indicates the Input signal has exceeded the Lower Limit for the time defined by Delay Time.

M7.10 Limit Exceeded (R/O)

Indicates the Input signal has exceeded either the Upper Limit or Lower Limit for the time defined by Delay Time.

M8: Threshold 8 (Latch)

M8.01 Enable (R/W, Preset: Disabled)

M8.02 Input (R/W, Preset: 0.00%)

M8.03 Upper Limit (R/W, Preset: 90.00%)

M8.04 Lower Limit (R/W, Preset: 10.00%)

M8.05 Delay Time (R/W, Preset: 0.0Secs)

M8.06 Reset Mode (R/W, Preset: Manual)

M8.07 Manual Reset (R/W, Preset: Off)

M8.08 Upper Limit Exceeded (R/O)

M8.09 Lower Limit Exceeded (R/O)

M8.10 Limit Exceeded (R/O)

Thresholds 8 is functionally identical to Threshold 7. Refer to M7.XX.

7.14 N: Timers

The drive provided six timer blocks. Each of the timers can operate in one of six modes.

N1: Timer 1

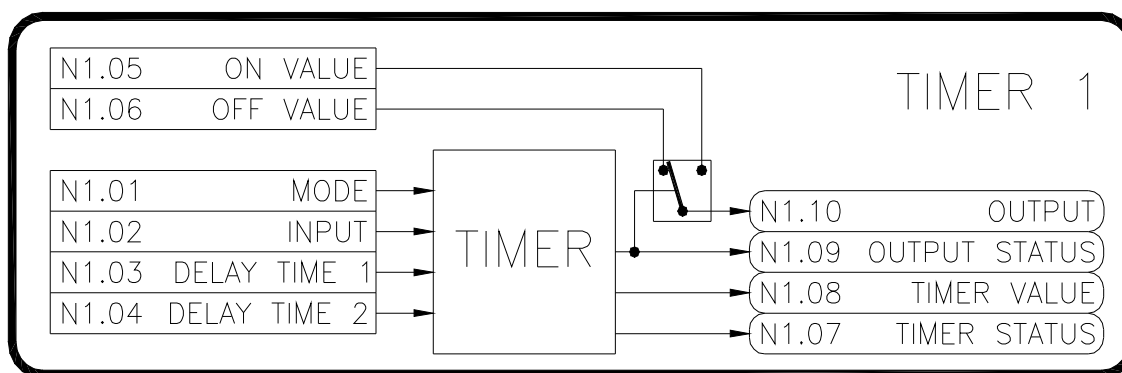


Figure 65

N1.01 Timer 1 Mode (R/W, Preset: On Delay)

Selects the operating mode of the timer. Refer to Figure 66.

ON DELAY

When N1.02 changes to **ON**, the internal switch turns on after a delay set by N1.03. When the input changes to **OFF**, the internal switch turns off immediately.

OFF DELAY

When N1.02 changes to **OFF**, the internal switch turns off after a delay set by N1.03. When the input changes to **ON**, the internal switch turns on immediately.

ONE SHOT

When N1.02 changes to **ON**, the internal switch turns on immediately. After a delay set by N1.03, the switch turns off. The timer ignores any successive input changes while the timer is timing (i.e. successive input changes do not reset the timing). After the timer has stopped, the timer can be restarted by toggling N1.02 from **OFF** to **ON**.

ONE SHOT (RE-TRIGGERABLE)

Performs the same as the **ONE SHOT** described above, except that successive state changes on the input restart the timing.

SINGLE CYCLE

When N1.02 changes to **ON**, the timer executes a delay defined by N1.03. After the delay, the switch turns on for the amount of time set by N1.04.

REPEAT CYCLE

When N1.02 changes to **ON**, the switch immediately turns on for the time defined by N1.03. Then the switch turns off for the time defined by N1.04. The cycle continues to repeat until N1.02 is **OFF**.

N1.02 Timer 1 Input (R/W, Preset: Off)

The input to the timer block.

N1.03 Timer 1 Delay Time 1 (R/W, Preset: 5.0 Secs)

Initial delay time. Range: 0.1..600 Secs

N1.03 Timer 1 Delay Time 1 (R/W, Preset: 5.0 Secs)

Second delay time. Used only when N1.01 is set to **SINGLE CYCLE** or **REPEAT CYCLE**.

Range: 0.1..600 Secs

N1.05 Timer 1 On Value (R/W, Preset: 100.00%)

The ON input to the switch. The value is selected when the switch is on. Range: -300..300%

N1.06 Timer 1 Off Value (R/W, Preset: 0.00%)

The OFF input to the switch. The value is selected when the switch is off. Range: -300..300%

N1.07 Timer 1 Status (RO)

Indicates the status of the timer: **STOPPED** or **TIMING**.

N1.08 Timer 1 Value (RO)

The value of the timer.

N1.09 Timer 1 Output Status (RO)

Displays the status of the timer switch, either **ON** or **OFF**.

N1.10 Timer 1 Output (RO)

The output of the timer block. This parameter will equal N1.05 when the switch is on. It will equal N1.06 when the switch is off.

N2: Timer 2
N3: Timer 3
N4: Timer 4
N5: Timer 5
N6: Timer 6

Timers 2-6 are functionally identical to Timer 1. Refer to N1.XX.

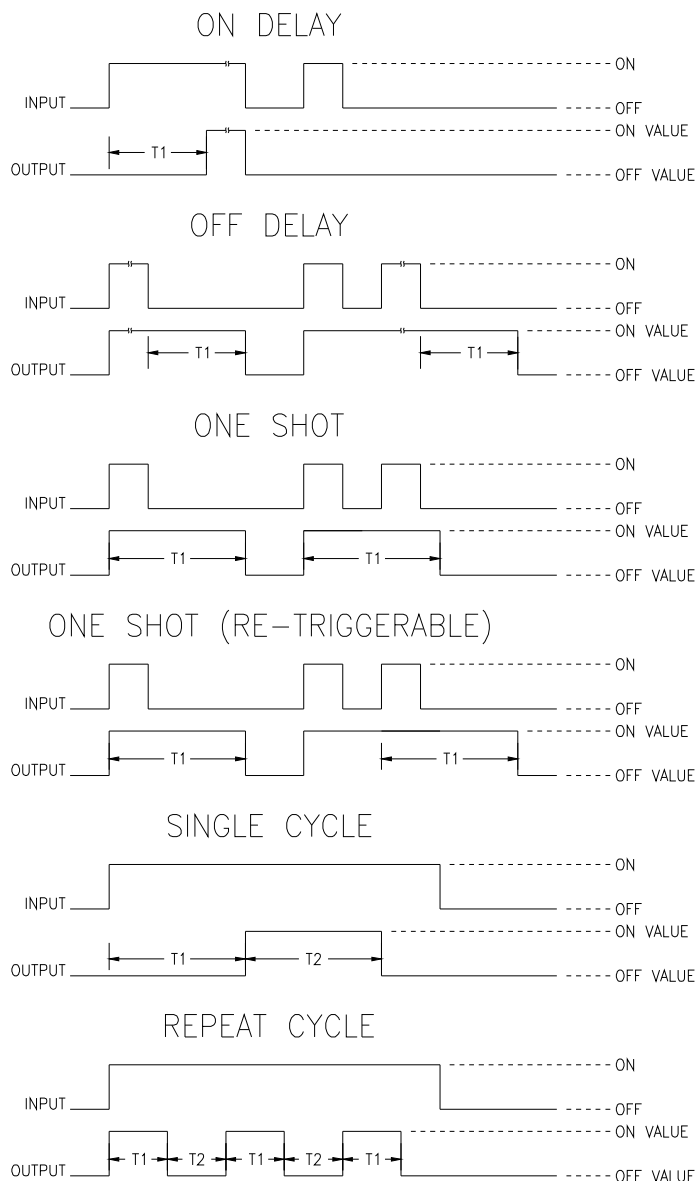


Figure 66

7.15 O: Logic Gates

The Logic Gate blocks provide basic boolean logic and comparison functions.

O1: Logic Gate 1

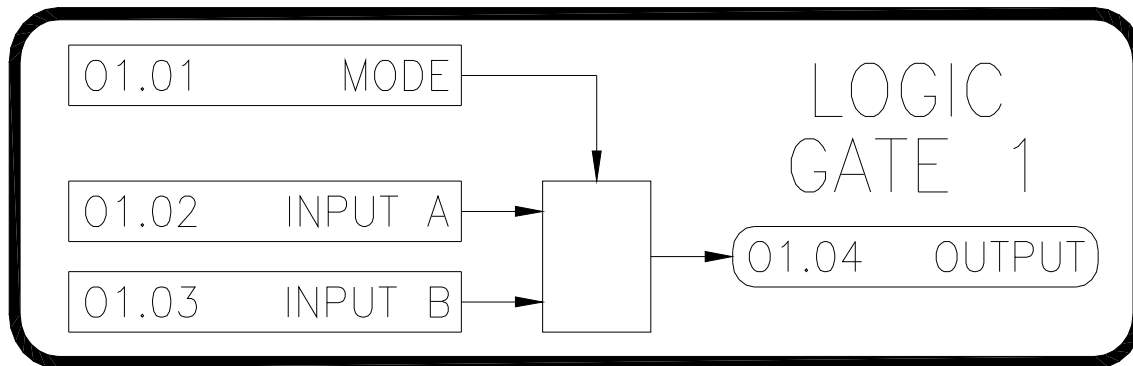


Figure 67

O1.01 Logic Gate 1 Mode (R/W, Preset: A And B)

Selects the function of the logic gate.

A AND B

Performs a logical AND between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **ON** only when both inputs are **OFF**. Refer to Table 16.

A NAND B

Performs a logical NAND between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **OFF** only when both inputs are **ON**. Refer to Table 16.

A OR B

Performs a logical OR between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **ON** when either of the inputs are **ON**. Refer to Table 16.

A NOR B

Performs a logical NOR between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **OFF** when either of the inputs are **ON**. Refer to Table 16.

A XOR B

Performs a logical XOR (exclusive or) between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **ON** when either of the inputs are **ON**, but not both. An alternative view is the output will be **ON** when the inputs are different from each other. Refer to Table 16.

A XNOR B

Performs a logical XNOR (exclusive nor) between Inputs A (O1.02) and Input B (O1.03). The output (O1.04) will be **ON** when the inputs equal each other. Refer to Table 16.

NOT A (LOGICAL INVERT)

Performs a logical inversion of Input A. The output (O1.04) will be the opposite of Input A. Refer to Table 16.

A > B?

The output (O1.04) will be **ON** when Input A (O1.02) is greater than Input B (O1.03).

A >= B?

The output (O1.04) will be **ON** when Input A (O1.02) is greater than or equal to Input B (O1.03).

A < B?

The output (O1.04) will be **ON** when Input A (O1.02) is less than Input B (O1.03).

A <= B?

The output (O1.04) will be **ON** when Input A (O1.02) is less than or equal to Input B (O1.03).

A EQUALS B?

The output (O1.04) will be **ON** when Input A (O1.02) is equal to Input B (O1.03).

A NOT EQUAL B?

The output (O1.04) will be **ON** when Input A (O1.02) is not equal to Input B (O1.03).

|A|

The output (O1.04) will be the absolute value of Input A (O1.02).

-|A|

The output (O1.04) will be the negative absolute value of Input A (O1.02).

-A

The output (O1.04) will be the negative of Input A (O1.02).

A + B

The output (O1.04) will be the sum of Input A (O1.02) and Input B (O1.03).

A - B

The output (O1.04) will be the difference between Input A (O1.02) and Input B (O1.03).

*A * B*

The output (O1.04) will be the product of Input A (O1.02) and Input B (O1.03).

A / B

The output (O1.04) will be the quotient (result) of Input A (O1.02) divided by Input B (O1.03).

FILTER

Input A (O1.02) is the filter input. Input B (O1.03) is the filter gain. The filter output is O1.04.

SR FLIP FLOP

Functions as a Set/Reset Flip Flop. Input A (O1.02) functions as the Set input. Input B (O1.03) functions as the Reset input. The flip flop output is O1.04. Refer to Table 16.

POS EDGE LATCH

The value of Input A (O1.02) is latched into the output (O1.04) when Input B (O1.03) changes from **OFF** to **ON**.

NEG EDGE LATCH

The value of Input A (O1.02) is latched into the output (O1.04) when Input B (O1.03) changes from **ON** to **OFF**.

O1.02 Logic Gate 1 Input A (R/W, Preset: False*)

Input A to the logic gate. *Note that the formatting/units of this parameter will change depending upon the mode selected by O1.01.

O1.03 Logic Gate 1 Input B (R/W, Preset: False*)

Input B to the logic gate. *Note that the formatting/units of this parameter will change depending upon the mode selected by O1.01.

O1.04 Logic Gate 1 Output (R/W, Preset: False*)

Output of the logic gate. *Note that the formatting/units of this parameter will change depending upon the mode selected by O1.01.

Input A (O1.02)	Input B (O1.03)	Output (O1.04)						
		AND	NAND	OR	NOR	XOR	XNOR	SR FF
Off	Off	Off	On	Off	On	Off	On	No Change
Off	On	Off	On	On	Off	On	Off	Off
On	Off	Off	On	On	Off	On	Off	On
On	On	On	Off	On	Off	Off	On	Off

Table 16: Logic Gates Truth Table

O2: Logic Gate 2
O3: Logic Gate 3
O4: Logic Gate 4
O5: Logic Gate 5
O6: Logic Gate 6

Logic Gates 2-6 are functionally identical to Logic Gate 1. Refer to O1.XX.

7.16 P: Switches

The drive provides 6 internal single pole double throw switches.

P1: Switch 1

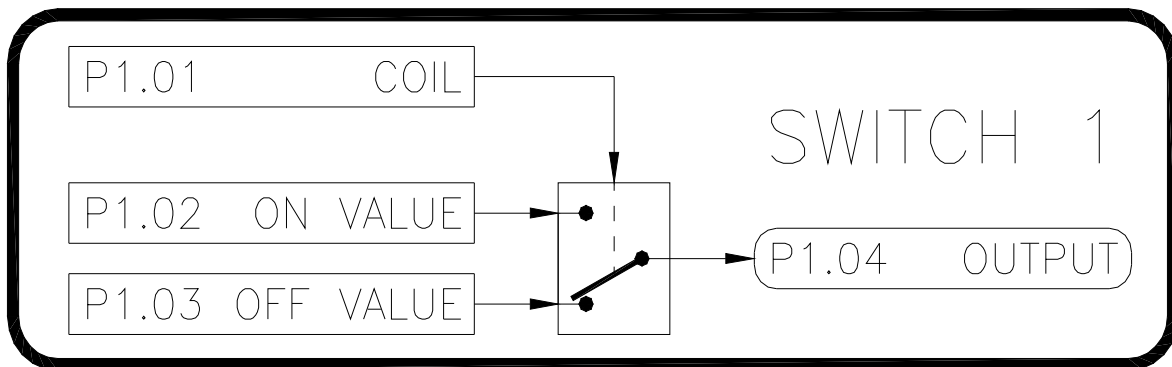


Figure 68

P1.01 Switch 1 Coil (R/W, Preset: Off)

Defines the status of the switch: **ON** or **OFF**.

P1.02 Switch 1 On Value (R/W, Preset: 0.00%)

The ON input to the switch. The value is selected when the switch is on.

Range: -327.68..327.67%

P1.03 Switch 1 Off Value (R/W, Preset: 0.00%)

The OFF input to the switch. The value is selected when the switch is off.

Range: -327.68..327.67%

P1.04 Switch 1 Output (RO)

The output of the switch. This parameter will equal P1.02 when the switch is on and P1.03 when the switch is off.

P2: Switch 2

P3: Switch 3

P4: Switch 4

P5: Switch 5

P6: Switch 6

Switches 2-6 are functionally identical to Switch 1. Refer to P1.XX.

7.17 Q: Internal Links

The internal links can be used to connect or link parameters together. The source parameter selects the parameter from which data will be retrieved. The destination parameter selects the parameter to which the data will be written. In other words, the value of the parameter identified by Source will be written to the parameter identified by Destination. The drive provides 30 links that are separated into 3 groups for custom configuration. Each link has a source and a destination.

Q1: Internal Link Group 1

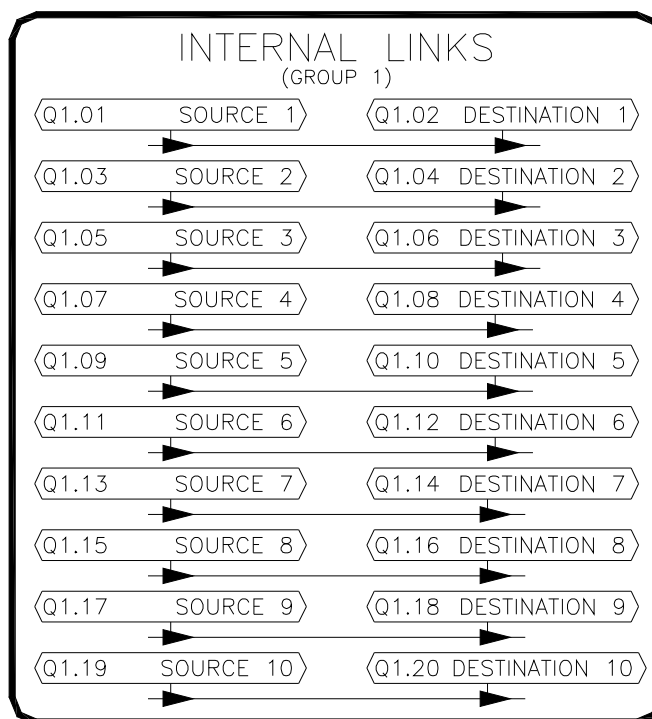


Figure 69

Q1.01 Internal Link 1 Src (ICR, Preset: J1.21 [Ramp Output])

Defines the source parameter via its tag.

Q1.02 Internal Link 1 Dest (ICR, Preset: G1.19 [Open Loop Ref])

Defines the destination or target parameter via its tag.

Q1.03 Internal Link 2 Src (ICR, Preset: J1.21 [Ramp Output])

Defines the source parameter via its tag.

Q1.04 Internal Link 2 Dest (ICR, Preset: G1.19 [Torque Reference])

Defines the destination or target parameter via its tag.

Q1.05-Q1.20

These parameters are functionally equivalent to the ones listed above. They do not have any preset values.

Q2: Internal Link Group 2

Q3: Internal Link Group 3

The Q2 and Q3 blocks are functionally identical to Q1. Refer to Q1.XX.

7.18 R: Communications

R1: Com Port A (CN12: USB)

R1.01 PortA Clear Counters (R/W, Preset: Off)

Resets R1.02-R1.10 to zero when set to **ON**. Value automatically returns to **OFF**.

R1.02 PortA Bus Messages (RO)

The total number of bus messages.

R1.03 PortA Bus Com Errors (RO)

The total number of bus messages that have CRC errors.

R1.04 PortA Bus Exceptions (RO)

The total number of exception errors.

R1.05 PortA Device Message (RO)

The total number of messages that were addressed to this drive.

R1.06 PortA Device No Resp (RO)

The total number of times the drive did not respond to a message due to an error.

R1.07 PortA Break Detected (RO)

The total number of times the drive detected a break condition.

R1.08 PortA Framing Errors (RO)

The total number of times the drive detected a framing error.

R1.09 PortA Overrun Errors (RO)

The total number of times a buffer overrun error occurred.

R1.10 PortA Parity Errors (RO)

The total number of times a parity error was detected.

PORT A (USB)	
R1.01	CLEAR COUNTERS
R1.02	BUS MSG COUNT
R1.03	BUS COMM ERROR COUNT
R1.04	BUS EXC ERROR COUNT
R1.05	DEVICE MSG COUNT
R1.06	DEVICE NO RESP COUNT
R1.07	BREAK DETECTED COUNT
R1.08	FRAMING ERROR COUNT
R1.09	OVERRUN ERROR COUNT
R1.10	PARITY ERROR COUNT

Figure 70

R2: Com Port B (CN9: Keypad)

R2.01 PortB Clear Counters (R/W, Preset: Off)

Resets R2.02-R2.10 to zero when set to **ON**. Value automatically returns to **OFF**.

R2.02 PortB Bus Messages (RO)

The total number of bus messages detected.

R2.03 PortB Bus Com Errors (RO)

The total number of bus messages that have CRC errors.

R2.04 PortB Bus Exceptions (RO)

The total number of exception errors.

R2.05 PortB Device Message (RO)

The total number of messages that were addressed to this drive.

R2.06 PortB Device No Resp (RO)

The total number of times the drive did not respond to a message due to an error.

R2.07 PortB Break Detected (RO)

The total number of times the drive detected a break condition.

R2.08 PortB Framing Errors (RO)

The total number of times the drive detected a framing error.

R2.09 PortB Overrun Errors (RO)

The total number of times a buffer overrun error occurred.

R2.10 PortB Parity Errors (RO)

The total number of times a parity error was detected.

R2.11 Keypad Status (RO)

Indicates the status of the keypad either **ONLINE** or **OFFLINE**.

PORT B (KEYPAD)	
R2.01	CLEAR COUNTERS
R2.02	BUS MSG COUNT
R2.03	BUS COMM ERROR COUNT
R2.04	BUS EXC ERROR COUNT
R2.05	DEVICE MSG COUNT
R2.06	DEVICE NO RESP COUNT
R2.07	BREAK DETECTED COUNT
R2.08	FRAMING ERROR COUNT
R2.09	OVERRUN ERROR COUNT
R2.10	PARITY ERROR COUNT
R2.11	KEYPAD STATUS

Figure 71

R3: Com Port C (TB2: RS422/485)

R3.01 PortC Modbus Address (R/W, Preset: 1)

Sets the Modbus® network address of the drive. Refer to R3.05. Range: 1..247

R3.02 PortC Baud Rate (R/W, Preset: 38400)

Sets the communication speed. Available rates are **2400, 4800, 9600, 19200, 38400, 57600, 76800, & 115200**. Refer to R3.05.

R3.03 PortC Parity (R/W, Preset: None)

Sets the parity. Available selections are **NONE, ODD, & EVEN**. Refer to R3.05.

R3.04 PortC Stop Bits (R/W, Preset: 2 Stop Bits)

Sets the number of stop bits. Available selections are **1 STOP BIT & 2 STOP BITS**. Refer to R3.05.

R3.05 PortC Apply (R/W, Preset: Off)

Changes to parameters R3.01-R3.04 & R3.20-R3.32 do not take affect until they are applied by setting this parameter to **ON**. The changes can also be applied by cycling power on the drive. Value automatically returns to **OFF**.

R3.06 PortC Clear Counters (R/W, Preset: Off)

Resets R3.02-R3.10 to zero when set to **ON**. Value automatically returns to **OFF**.

R3.07 PortC Bus Messages (RO)

The total number of bus messages detected. This includes messages that are not addressed to the drive.

R3.08 PortC Bus Com Errors (RO)

The total number of bus messages that have CRC errors.

R3.09 PortC Bus Exceptions (RO)

The total number of exception errors.

R3.10 PortC Device Message (RO)

The total number of messages that were addressed to this drive.

R3.11 PortC Device No Resp (RO)

The total number of times the drive did not respond to a message due to an error.

R3.12 PortC Break Detected (RO)

The total number of times the drive detected a break condition.

R3.13 PortC Framing Errors (RO)

The total number of times the drive detected a framing error.

R3.14 PortC Overrun Errors (RO)

The total number of times a buffer overrun error occurred.

R3.15 PortC Parity Errors (RO)

The total number of times a parity error was detected.

R3.16 PortC Timeout Enable (R/W, Preset: Disabled)

When ENABLED, the drive will generate a fault or an alarm (selectable by R3.18) if the drive does not detect any communication activity within the time period set by R3.17.

R3.17 PortC Timeout Period (R/W, Preset: 0.5 Secs)

Determines the inactivity time that must occur on Port C before an R3.18 event is generated. Range: 0..20 Secs

PORT C (RS485)

R3.01	NETWORK ADDRESS
R3.02	BAUD RATE
R3.03	PARITY
R3.04	STOP BITS
R3.05	APPLY
R3.06	CLEAR COUNTERS
R3.07	BUS MSG COUNT
R3.08	BUS COMM ERROR COUNT
R3.09	BUS EXC ERROR COUNT
R3.10	DEVICE MSG COUNT
R3.11	DEVICE NO RESP COUNT
R3.12	BREAK DETECTED COUNT
R3.13	FRAMING ERROR COUNT
R3.14	OVERRUN ERROR COUNT
R3.15	PARITY ERROR COUNT
R3.16	TIMEOUT ENABLE
R3.17	TIMEOUT PERIOD
R3.18	TIMEOUT ACTION
R3.19	TIMEOUT STATUS
R3.20	ETHERNET ADDR MODE
R3.21	IP ADDR 1
R3.22	IP ADDR 2
R3.23	IP ADDR 3
R3.24	IP ADDR 4
R3.25	SUBNET 1
R3.26	SUBNET 2
R3.27	SUBNET 3
R3.28	SUBNET 4
R3.29	GATEWAY 1
R3.30	GATEWAY 2
R3.31	GATEWAY 3
R3.32	GATEWAY 4
R3.33	TCP STATUS

Figure 72

R3.18 PortC Timeout Action (R/W, Preset: None)

Determines the action taken after inactivity on Port C. Available selections are **NONE**, **ALARM**, & **FAULT**.

R3.19 PortC Timeout Status (RO)

Used only when R3.16 is set to **ENABLED**. Displays the timeout status, either **ERROR** or **OK**.

R3.20 Ethernet Addressing Mode (RW, Preset: Auto)

Determines the method by which the unit obtains an IP address. Only applicable with the C14521-002 option board. When set to **MANUAL**, parameters R3.21-R3.32 determine the IP settings. When set to **AUTO**, the IP settings are set via a DHCP server. The assigned values are displayed in R3.21-R3.32. Refer to the option board manual for more information. Refer also to R3.05.

R3.21-R3.24 IP Address (RW, Preset: 192.168.0.254)

These four parameters define/show the IP address of the unit. Refer to the option board manual for more information. Refer also to R3.05.

R3.25-R3.28 Subnet Mask (RW, Preset: 255.255.255.0)

These four parameters define/show the Subnet Mask of the unit. Refer to the option board manual for more information. Refer also to R3.05.

R3.29-R3.32 Gateway Address (RW, Preset: 192.168.0.1)

These four parameters define/show the Gateway address of the unit. Refer to the option board manual for more information. Refer also to R3.05.

R3.33 TCP Client Connected Status (RO)

Displays the TCP client connected status: 0=No connections, 1=client(s) connected. Only applicable with C14521-002 option board. Refer to the option board manual for more information.

7.19 S: Zero Speed

S1: Zero Speed

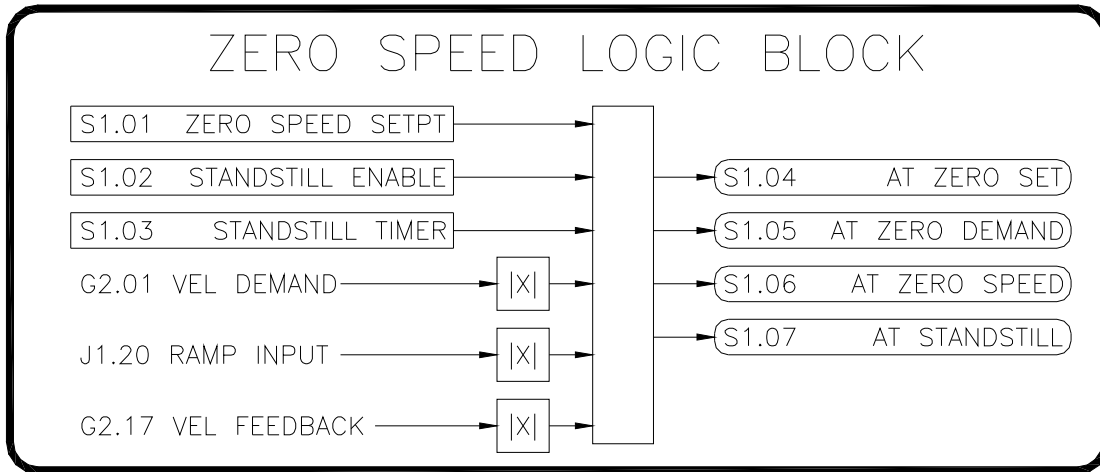


Figure 73

S1.01 Zero Speed Setpoint (R/W, Preset: 4.00%)

Sets the speed level that the drive considers to be stopped. When ramping to stop, the drive drops out the armature contactor when this level is reached. Range: 0.5..25%

S1.02 Standstill Enable (R/W, Preset: Enabled)

In applications where the drive is in the Run mode with zero velocity reference, motor creepage may be apparent under some load conditions. When **ENABLED**, the Standstill function clamps the loops while the drive's velocity reference and feedback are below the zero speed level.

S1.03 Standstill Timer (R/W, Preset: 0.1 Secs)

Defines the timer period where both the Velocity Demand (G2.01) and the Velocity Feedback (G2.17) must be below the Zero Speed Setpoint (S1.01) before At Standstill (S1.06) becomes **ON**. Range: 0..10 Secs

S1.04 At Zero Setpoint (RO)

ON indicates the Reference (I1.10) parameter is below the Zero Speed Setpoint (S1.01) .

S1.05 At Zero Demand (RO)

ON indicates the Velocity Demand (G2.01) parameter is below the Zero Speed Setpoint (S1.01) .

S1.06 At Zero Speed (RO)

ON indicates the Velocity Feedback (G2.17) parameter is below the Zero Speed Setpoint (S1.01).

S1.07 At Standstill (RO)

When S1.02 is **ENABLED**, a value of **ON** indicates that the drive's velocity demand (G2.01) and feedback (G2.17) are both below the zero speed setpoint (S1.01).

T1: System Status**T1.01 Drive Model (RO)**

Displays the drive's model number.

T1.02 Rated Armature Curr (RO)

Displays the drive's rated armature current.

T1.03 Rated Field Current (RO)

Displays the drive's rated field current.

T1.04 Firmware Version (RO)

Displays the drive's firmware version.

T1.05 Control Board ID Raw (RO)

Displays the control board's raw ID value.

T1.06 Control Board ID (RO)

Displays the control board's ID value.

T1.07 Model Type (RO)

Displays the type of drive model: **REGENERATIVE** or **NON-REGENERATIVE**.

T1.08 Edit In Progress (RO)

ON indicates a drive parameter is being edited via the keypad. The drive is prohibited from running in this state.

T1.09 Reset Source (RO)

Displays the source of the last processor reset: **EXTERNAL**, **WATCHDOG**, or **SOFTWARE**.

T1.10 Phase Loss Status (RO)

ON indicates at least one of the three phase AC lines is missing.

T1.11 CT ID Status (RO)

Displays the current transformer board ID value.

T1.12 Heatsink Temp Raw (RO)

Displays the raw analog to digital conversion value from the heatsink temperature sensor.

T1.13 Heatsink Temperature (RO)

Displays the heatsink temperature in degrees Celsius.

T1.14 Heatsink OT Level (RO)

Displays the heatsink over temperature level. A heatsink over temperature fault is generated when T1.13 exceeds this level.

T1.15 EEPROM Fault Status (RO)

Displays the status of the last EEPROM operation: **NO FAULT**, **READ FAULT**, **WRITE FAULT**.

T1.16 EEPROM Alarm Status Code (RO)

Displays the EEPROM alarm code that generated the alarm. An EEPROM alarm is generated if an error occurs whenever the drive attempts to save a parameter to the EEPROM.

T1.17 Option Board ID Raw (RO)

Displays the raw option board ID value.

T1.18 Option Board ID (RO)

Displays the installed option board ID.

SYSTEM	
SYSTEM STATUS	
T1.01	DRIVE MODEL
T1.02	RATED ARMATURE CURRENT
T1.03	RATED FIELD CURRENT
T1.04	FIRMWARE VERSION
T1.05	CONTROL BOARD ID RAW
T1.06	CONTROL BOARD ID
T1.07	MODEL TYPE
T1.08	MENU EDIT IN PROGRESS
T1.09	RESET SOURCE
T1.10	PHASE LOSS STATUS
T1.11	CT ID STATUS
T1.12	HSK TEMP RAW
T1.13	HEATSINK TEMP
T1.14	HEATSINK OT LEVEL
T1.15	EEPROM FAULT STATUS
T1.16	EEPROM ALARM STATUS
T1.17	OPTION BOARD ID RAW
T1.18	OPTION BOARD ID

SYSTEM OPTIONS	
T2.01	PARAMETER SAVE
T2.02	LINE FREQ SELECTION
T2.03	LINE FREQUENCY STATUS
T2.04	REGEN ENABLE
T2.05	FAN(S) MODE
T2.06	FAN(S) STATUS

Figure 74

T2: System Options

T2.01 Parameter Save (R/W, Preset: Off)

When parameter changes are made via the keypad, the changes are automatically saved.

Parameters changes made over one of the communication ports are not saved. Setting this parameter to **ON** will save all of the current drive parameters. Value automatically returns to **OFF**.

T2.02 Line Freq Select (ICR, Preset: Auto)

Determines how the drive detects the frequency of the incoming three phase AC line. When set to **AUTO**, the drive will automatically detect the incoming frequency. If the drive has trouble detecting the frequency, it can be specifically set to **50 HZ** or **60 HZ**.

T2.03 Line Freq Status (RO)

When T2.02 is set to **AUTO**, this indicates the line frequency detected by the drive. If a specific frequency is selected via T2.02, it will also be displayed here.

T2.04 Regenerative Enable (ICR, Preset: Enabled)

Used only when T1.07 is **REGENERATIVE**. When **DISABLED**, the reverse bridge is disabled and forces a regenerative drive to emulate a non-regenerative drive.

T2.05 Fan Mode (R/W, Preset: Auto)

When set to **AUTO**, the fan(s) are thermostatically controlled. They will turn on and off automatically based on the heatsink temperature. The fans can be forced on by setting this value to **ON**.

T2.06 Fan Status (RO)

Indicates the current state of the fans.

SYSTEM OPTIONS	
T2.01	PARAMETER SAVE
T2.02	LINE FREQ SELECTION
T2.03	LINE FREQUENCY STATUS
T2.04	REGEN ENABLE
T2.05	FAN(S) MODE
T2.06	FAN(S) STATUS

Figure 75

7.21 U: Auxiliary

The drive provides 20 auxiliary parameters for general purpose use. Many times they are used when it is desired to link an input to an output. Since this cannot be done directly, an auxiliary parameter can be used as a tie point. Also, the drive's inputs and outputs can be used as remote I/O via the communications ports. In these cases, the auxiliary parameters can be used as a destination for the inputs or a source for the outputs.

U1: Auxiliary

U1.01 Aux 1 (R/W, Preset: 0.00%)
U1.02 Aux 2 (R/W, Preset: 0.00%)
U1.03 Aux 3 (R/W, Preset: 0.00%)
U1.04 Aux 4 (R/W, Preset: 0.00%)
U1.05 Aux 5 (R/W, Preset: 0.00%)
U1.06 Aux 6 (R/W, Preset: 0.00%)
U1.07 Aux 7 (R/W, Preset: 0.00%)
U1.08 Aux 8 (R/W, Preset: 0.00%)
U1.09 Aux 9 (R/W, Preset: 0.00%)
U1.10 Aux 10 (R/W, Preset: 0.00%)
U1.11 Aux 11 (R/W, Preset: 0.00%)
U1.12 Aux 12 (R/W, Preset: 0.00%)
U1.13 Aux 13 (R/W, Preset: 0.00%)
U1.14 Aux 14 (R/W, Preset: 0.00%)
U1.15 Aux 15 (R/W, Preset: 0.00%)
U1.16 Aux 16 (R/W, Preset: 0.00%)
U1.17 Aux 17 (R/W, Preset: 0.00%)
U1.18 Aux 18 (R/W, Preset: 0.00%)
U1.19 Aux 19 (R/W, Preset: 0.00%)
U1.20 Aux 20 (R/W, Preset: 0.00%)

Range: -327.68..+327.67%

AUXILIARY	
U1.01	AUX 1
U1.02	AUX 2
U1.03	AUX 3
U1.04	AUX 4
U1.05	AUX 5
U1.06	AUX 6
U1.07	AUX 7
U1.08	AUX 8
U1.09	AUX 9
U1.10	AUX 10
U1.11	AUX 11
U1.12	AUX 12
U1.13	AUX 13
U1.14	AUX 14
U1.15	AUX 15
U1.16	AUX 16
U1.17	AUX 17
U1.18	AUX 18
U1.19	AUX 19
U1.20	AUX 20

Figure 76

7.22 Parameter Table

The following table lists all the Elite Pro V3 parameters and their properties.

ICR=Inhibit Change while Running

R/W=Read/Write

RO=Read Only

Table 17: Parameters

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
A1.01	2177	Parameter Visibility	RW	Standard..Advanced	Standard	
A1.02	2178	Operating Mode	ICR	Vel..Const HP..Torq	Velocity	
A1.03	2179	Initialize	ICR	0..65535	0	
A1.04	2180	Define Password	RW	0..65535	0	
A1.05	2181	Enter Password	RW	0..65535	0	
B1.01	4225	Digital Input 1 Destination	ICR	A1.01..U1.20	H1.02	
B1.02	4226	Digital Input 1 Status	RO	Off..On	Off	
B1.03	4227	Digital Input 1 Off Value	RW	Varies	0	
B1.04	4228	Digital Input 1 On Value	RW	Varies	1	
B2.01	4353	Digital Input 2 Destination	ICR	A1.01..U1.20	H1.03	
B2.02	4354	Digital Input 2 Status	RO	Off..On	Off	
B2.03	4355	Digital Input 2 Off Value	RW	Varies	0	
B2.04	4356	Digital Input 2 On Value	RW	Varies	1	
B3.01	4481	Digital Input 3 Destination	ICR	A1.01..U1.20	H1.04	
B3.02	4482	Digital Input 3 Status	RO	Off..On	Off	
B3.03	4483	Digital Input 3 Off Value	RW	Varies	0	
B3.04	4484	Digital Input 3 On Value	RW	Varies	1	
B4.01	4609	Digital Input 4 Destination	ICR	A1.01..U1.20	H1.05	
B4.02	4610	Digital Input 4 Status	RO	Off..On	Off	
B4.03	4611	Digital Input 4 Off Value	RW	Varies	0	
B4.04	4612	Digital Input 4 On Value	RW	Varies	1	
B5.01	4737	Digital Input 5 Destination	ICR	A1.01..U1.20	I1.02	
B5.02	4738	Digital Input 5 Status	RO	Off..On	Off	
B5.03	4739	Digital Input 5 Off Value	RW	Varies	0	
B5.04	4740	Digital Input 5 On Value	RW	Varies	1	
B6.01	4865	Digital Input 6 Destination	ICR	A1.01..U1.20	I1.03	
B6.02	4866	Digital Input 6 Status	RO	Off..On	Off	
B6.03	4867	Digital Input 6 Off Value	RW	Varies	0	
B6.04	4868	Digital Input 6 On Value	RW	Varies	1	
B7.01	4993	Digital Input 7 Destination	ICR	A1.01..U1.20	K1.15	
B7.02	4994	Digital Input 7 Status	RO	Off..On	Off	
B7.03	4995	Digital Input 7 Off Value	RW	Varies	0	
B7.04	4996	Digital Input 7 On Value	RW	Varies	1	
B8.01	5121	Frequency Input Destination	ICR	A1.01..U1.20	00.00	
B8.02	5122	Frequency Input Mode	ICR	Freq..Sonic	Freq	
B8.03	5123	Frequency Input Status	RO	0..50,000Hz	0Hz	
B8.04	5124	Frequency Input Status	RO	0..420.00"	0.00"	
B8.05	5125	Frequency Input Filtering	RW	0..15	0	
B8.06	5126	Frequency Input 0% Calibration	RW	0..50,000Hz	0Hz	
B8.07	5127	Frequency Input 100% Calibration	RW	0..50,000Hz	50,000Hz	
B8.08	5128	Frequency Input 0% Calibration	RW	0..420.00"	0.00"	
B8.09	5129	Frequency Input 100% Calibration	RW	0..420.00"	420.00"	
B8.10	5130	Frequency Input Bias	RW	Varies by Destination	0.00	
B8.11	5131	Frequency Input Gain	RW	Varies by Destination	100.00	
B8.12	5132	Frequency Input Polarity	RW	Pos..Neg	Pos	
B8.13	5133	Frequency Input Out Of Range	RO	Off..On	Off	
B8.20	5140	Counter Destination	ICR	A1.01..U1.20	00.00	
B8.21	5141	Counter Enable	RW	Disabled..Enabled	Disabled	
B8.22	5142	Counter Direction	RW	Down..Up	Up	
B8.23	5143	Rollover Enable	RW	Disabled..Enabled	Disabled	
B8.24	5144	Counter Reset	RW	Off..On	Off	
B8.25	5145	Reset Value Low	RW	0..65535	0	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
B8.26	5146	Reset Value High	RW	0..65535	0	
B8.27	5147	Count Low	RO	0..65535	0	
B8.28	5148	Count High	RO	0..65535	0	
B8.29	5149	Divisor	RW	1..65535	1	
C1.01	6273	Analog Input 1 Destination	ICR	A1.01..U1.20	I1.04	
C1.02	6274	Analog Input 1 Status	RO	-2048..4095	0	
C1.03	6275	Analog Input 1 Polarity	ICR	Unipolar..Bipolar	Unipolar	
C1.04	6276	Analog Input 1 Filtering	RW	0..15	0	
C1.05	6277	Analog Input 1 Type	ICR	Voltage..Current	Voltage	
C1.06	6278	Analog Input 1 Unipolar 0% Cal	RW	0..4095	0	
C1.07	6279	Analog Input 1 Unipolar 100% Cal	RW	0..4095	4095	
C1.09	6281	Analog Input 1 Bipolar 100% Cal	RW	0..2047	2047	
C1.10	6282	Analog Input 1 Bias	RW	Varies by Destination	0.00%	
C1.11	6283	Analog Input 1 Gain	RW	Varies by Destination	100.00%	
C2.01	6401	Analog Input 2 Destination	ICR	A1.01..U1.20	00.00	
C2.02	6402	Analog Input 2 Status	RO	-2048..4095	0	
C2.03	6403	Analog Input 2 Polarity	ICR	Unipolar..Bipolar	Unipolar	
C2.04	6404	Analog Input 2 Filtering	RW	0..15	0	
C2.05	6405	Analog Input 2 Type	ICR	Voltage..Current	Voltage	
C2.06	6406	Analog Input 2 Unipolar 0% Cal	RW	0..4095	0	
C2.07	6407	Analog Input 2 Unipolar 100% Cal	RW	0..4095	4095	
C2.09	6409	Analog Input 2 Bipolar 100% Cal	RW	0..2047	2047	
C2.10	6410	Analog Input 2 Bias	RW	Varies by Destination	0.00	
C2.11	6411	Analog Input 2 Gain	RW	Varies by Destination	100.00	
C3.01	6529	Analog Input 3 Destination	ICR	A1.01..U1.20	00.00	
C3.02	6530	Analog Input 3 Status	RO	-2048..4095	0	
C3.03	6531	Analog Input 3 Polarity	ICR	Unipolar..Bipolar	Unipolar	
C3.04	6532	Analog Input 3 Filtering	RW	0..15	0	
C3.05	6533	Analog Input 3 Type	ICR	Voltage..Current	Voltage	
C3.06	6534	Analog Input 3 Unipolar 0% Cal	RW	0..4095	0	
C3.07	6535	Analog Input 3 Unipolar 100% Cal	RW	0..4095	4095	
C3.09	6537	Analog Input 3 Bipolar 100% Cal	RW	0..2047	2047	
C3.10	6538	Analog Input 3 Bias	RW	Varies by Destination	0.00	
C3.11	6539	Analog Input 3 Gain	RW	Varies by Destination	100.00	
C4.01	6657	Analog Input 4 Destination	ICR	A1.01..U1.20	00.00	
C4.02	6658	Analog Input 4 Status	RO	-2048..4095	0	
C4.03	6659	Analog Input 4 Polarity	ICR	Unipolar..Bipolar	Unipolar	
C4.04	6660	Analog Input 4 Filtering	RW	0..15	0	
C4.05	6661	Analog Input 4 Type	ICR	Voltage..Current	Voltage	
C4.06	6662	Analog Input 4 Unipolar 0% Cal	RW	0..4095	0	
C4.07	6663	Analog Input 4 Unipolar 100% Cal	RW	0..4095	4095	
C4.09	6665	Analog Input 4 Bipolar 100% Cal	RW	0..2047	2047	
C4.10	6666	Analog Input 4 Bias	RW	Varies by Destination	0.00	
C4.11	6667	Analog Input 4 Gain	RW	Varies by Destination	100.00	
C5.01	6785	Analog Input 5 Destination	ICR	A1.01..U1.20	00.00	
C5.02	6786	Analog Input 5 Status	RO	-2048..4095	0	
C5.03	6787	Analog Input 5 Polarity	ICR	Unipolar..Bipolar	Unipolar	
C5.04	6788	Analog Input 5 Filtering	RW	0..15	0	
C5.05	6789	Analog Input 5 Type	ICR	Voltage..Current	Voltage	
C5.06	6790	Analog Input 5 Unipolar 0% Cal	RW	0..4095	0	
C5.07	6791	Analog Input 5 Unipolar 100% Cal	RW	0..4095	4095	
C5.09	6793	Analog Input 5 Bipolar 100% Cal	RW	0..2047	2047	
C5.10	6794	Analog Input 5 Bias	RW	Varies by Destination	0.00	
C5.11	6795	Analog Input 5 Gain	RW	Varies by Destination	100.00	
D1.01	8321	Relay Output 1 Source	ICR	A1.01..U1.20	S1.06	
D1.02	8322	Relay Output 1 Absolute Value	RW	Off..On	Off	
D1.03	8323	Relay Output 1 On Value	RW	-300.00..300.00%	0.01%	
D1.04	8324	Relay Output 1 Off Value	RW	-300.00..300.00%	0.00%	
D1.05	8325	Relay Output 1 Status	RO	Off..On	Off	
D2.01	8449	Relay Output 2 Source	ICR	A1.01..U1.20	H1.16	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
D2.02	8450	Relay Output 2 Absolute Value	RW	Off..On	Off	
D2.03	8451	Relay Output 2 On Value	RW	-300.00..300.00%	0.01%	
D2.04	8452	Relay Output 2 Off Value	RW	-300.00..300.00%	0.00%	
D2.05	8453	Relay Output 2 Status	RO	Off..On	Off	
D3.01	8577	Relay Output 3 Source	ICR	A1.01..U1.20	K2.08	
D3.02	8578	Relay Output 3 Absolute Value	RW	Off..On	Off	
D3.03	8579	Relay Output 3 On Value	RW	-300.00..300.00%	0.01%	
D3.04	8580	Relay Output 3 Off Value	RW	-300.00..300.00%	0.00%	
D3.05	8581	Relay Output 3 Status	RO	Off..On	Off	
D4.01	8705	Freq/Digital Output Source	ICR	A1.01..U1.20	00.00	
D4.02	8706	Frequency/Digital Mode	ICR	Frequency..Digital	Frequency	
D4.03	8707	Frequency Output Gain	RW	0..300.00%	100.00%	
D4.04	8708	Frequency Output Bias	RW	0..300.00%	0.00%	
D4.05	8709	Freq Output Status	RO	0..50,000Hz	0Hz	
D4.06	8710	Digital Output Absolute Value	RW	Off..On	Off	
D4.07	8711	Digital Output On Value	RW	-300.00..300.00%	0.01%	
D4.08	8712	Digital Output Off Value	RW	-300.00..300.00%	0.01%	
D4.09	8713	Dig Output Status	RO	Off..On	Off	
D5.01	8833	Aux LED Output Source	ICR	A1.01..U1.20	H1.16	
D5.02	8834	Aux LED Output Absolute Value	RW	Off..On	Off	
D5.03	8835	Aux LED Output On Value	RW	-300.00..300.00%	0.01%	
D5.04	8836	Aux LED Output Off Value	RW	-300.00..300.00%	0.01%	
D5.05	8837	Aux LED Output Status	RO	Off..On	Off	
E1.01	10369	Analog Output 1 Source	ICR	A1.01..U1.20	G2.18	
E1.02	10370	Analog Output 1 Gain	RW	-300.00..300.00%	100.00%	
E1.03	10371	Analog Output 1 Bias	RW	-300.00..300.00%	0.00%	
E1.04	10372	Analog Output 1 Absolute Value	RW	Off..On	Off	
E1.05	10373	Analog Output 1 Status	RO	-4095..4095	0	
E2.01	10497	Analog Output 2 Source	ICR	A1.01..U1.20	G1.13	
E2.02	10498	Analog Output 2 Gain	RW	-300.00..300.00%	100.00%	
E2.03	10499	Analog Output 2 Bias	RW	-300.00..300.00%	0.00%	
E2.04	10500	Analog Output 2 Absolute Value	RW	Off..On	Off	
E2.05	10501	Analog Output 2 Status	RO	-4095..4095	0	
F1.01	12417	AC Line Voltage	ICR	0..510V	0V	
F1.02	12418	Armature Current	ICR	Varies	0A	
F1.03	12419	Armature Voltage	ICR	0..500V	0V	
F1.04	12420	Base Speed Field Current	ICR	Varies by Model	0A	
F1.05	12421	Extended Speed Field Current	ICR	Varies by Model	0A	
F1.06	12422	Base Speed Field Voltage	ICR	0.400V	0V	
F1.07	12423	Base Speed	ICR	0..9999 RPM	0 RPM	
F1.08	12424	Extended Speed	ICR	0..9999 RPM	0 RPM	
F2.01	12545	Tachometer Type	ICR	DC..AC	DC	
F2.02	12546	Invert Tach	ICR	Off..On	Off	
F2.03	12547	Tach Volts/1000 RPM	ICR	1..250V	50V	
F2.04	12548	Tach Jumper J1	RO	0..100	0	
F2.05	12549	Tach Jumper J2	RO	10..100	10	
F2.06	12550	Tach Jumper J3	RO	0..9	0	
F3.01	12673	Encoder Type	ICR	Quad..P&D..Pulse	Quad	
F3.02	12674	Encoder Pulses/Rev	ICR	1..65535	1024	
F3.03	12675	Invert Encoder	ICR	Off..On	Off	
F3.04	12676	Counter Input Destination	ICR	A1.01..U1.20	00.00	
F3.05	12677	Counter Enable	RW	Disabled..Enabled	Disabled	
F3.06	12678	Counter Direction	RW	Down..Up..Auto	Auto	
F3.07	12679	Rollover Enable	RW	Disabled..Enabled	Disabled	
F3.08	12680	Counter Reset	RW	Off..On	Off	
F3.09	12681	Reset Value Low	RW	0..65535	0	
F3.10	12682	Reset Value High	RW	0..65535	0	
F3.11	12683	Count Low	RO	0..65535	0	
F3.12	12684	Count High	RO	0..65535	0	
F3.13	12685	Divisor	RW	1..65535	1	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
G1.01	14465	Reference Select	ICR	Normal..Step	Normal	
G1.02	14466	Torque Reference	RW	-150.00..150.00%	0.00%	
G1.03	14467	Current Demand	RO	-150.00..150.00%	0.00%	
G1.04	14468	Aux Demand	RW	-150.00..150.00%	0.00%	
G1.05	14469	Positive Current Limit	RW	0..150.00%	150.00%	
G1.06	14470	Negative Current Limit	RW	0..150.00%	150.00%	
G1.07	14471	Slew Rate	RW	0..100.00%	0.00%	
G1.08	14472	Final Current Demand	RO	-150.00..150.00%	0.00%	
G1.09	14473	Final Current Demand Filtered	RO	-150.00..150.00%	0.00%	
G1.10	14474	Raw Current Feedback	RO	-4095..4095	0	
G1.11	14475	Current Feedback Cal Gain	ICR	90.00%..110.00%	100.00%	
G1.12	14476	Current Feedback	RO	-150.00..150.00%	0.00%	
G1.13	14477	Current Feedback Filtered	RO	-150.00..150.00%	0.00%	
G1.14	14478	Armature Amps	RO	Varies by Model	0A	
G1.15	14479	Current Error	RO	-300.00%..300.00%	0.00%	
G1.16	14480	Current Proportional Gain	RW	0.00..15.00	2.30	
G1.17	14481	Current Integral Time	RW	0.001..30.000Secs	0.400Secs	
G1.18	14482	Reserved	-	-	-	
G1.19	14483	Loop Mode	ICR	Open..Closed	Closed	
G1.20	14484	Open Loop Reference	RW	-100.00%..100.00%	0.00%	
G1.21	14485	Conduction	RO	-100.00%..100.00%	0.00%	
G1.22	14486	Conduction Raw	RO	0..65535	0	
G1.23	14487	Step Reference	RW	-150.00..150.00%	0.00%	
G1.24	14488	Step Duration	RW	0.000..10.000Secs	0.200Secs	
G1.25	14489	Step Enable	RW	Disabled..Enabled	Disabled	
G1.26	14490	Foldback Alarm Status	RO	Off..On	Off	
G1.27	14491	Armature Overcurrent Status	RO	Off..On	Off	
G2.01	14593	Velocity Demand	RO	-100.00%..100.00%	0.00%	
G2.02	14594	Forward Max Speed Scale	RW	0.00%..105.00%	100.00%	
G2.03	14595	Reverse Max Speed Scale	RW	0.00%..105.00%	100.00%	
G2.04	14596	Final Velocity Demand	RO	-105.00%..105.00%	0.00%	
G2.05	14597	Armature Feedback Raw	RO	0..4095	0	
G2.06	14598	Armature Feedback	RO	-120.00%..120.00%	0.00%	
G2.07	14599	Armature Feedback Filtered	RO	-120.00%..120.00%	0.00%	
G2.08	14600	Armature Voltage	RO	-600..600V	0V	
G2.09	14601	IR Compensation	RW	0.00..30.00%	0.00%	
G2.10	14602	Tach Feedback Raw	RO	0..4095	0	
G2.11	14603	Tach Feedback	RO	-125.00%..125.00%	0.00%	
G2.12	14604	Tach Feedback Filtered	RO	-125.00%..125.00%	0.00%	
G2.13	14605	Encoder Feedback	RO	-125.00%..125.00%	0.00%	
G2.14	14606	Encoder Feedback Filtered	RO	-125.00%..125.00%	0.00%	
G2.15	14607	Feedback Select	ICR	Arm..Tach..Encoder	Armature	
G2.16	14608	VFB Offset	RW	-10.00%..10.00%	0.00%	
G2.17	14609	Velocity Feedback	RO	-125.00%..125.00%	0.00%	
G2.18	14610	Velocity Feedback Filtered	RO	-125.00%..125.00%	0.00%	
G2.19	14611	Velocity Error	RO	-200.00%..200.00%	0.00%	
G2.20	14612	Alternate Gain Select	RW	Off..On	Off	
G2.21	14613	Velocity Prop Gain	RW	0.000..20.000	9.000	
G2.22	14614	Velocity Integral Time	RW	0.000..30.000Secs	0.164Secs	
G2.23	14615	Velocity Derivative Gain	RW	0.000..30.000	0.000	
G2.24	14616	Alternate Velocity Prop Gain	RW	0.000..20.000	5.000	
G2.25	14617	Alternate Velocity Integral Time	RW	0.000..30.000Secs	1.000Secs	
G2.26	14618	Alternate Velocity Derivative Gain	RW	0.000..30.000	0.000	
G2.27	14619	Velocity Loop Output	RO	-150.00%..150.00%	0.00%	
G2.28	14620	Custom Scale Enable	RW	Off..On	Off	
G2.29	14621	Custom RPM Scale	RW	0..10000RPM	0RPM	
G2.30	14622	Motor RPM	RO	-10000..10000RPM	0RPM	
G2.31	14623	Reference Select	ICR	Normal..Step	Normal	
G2.32	14624	Step Reference	RW	-100.00..100.00%	0.00%	
G2.33	14625	Step Duration	RW	0..30Secs	2Secs	
G2.34	14626	Step Enable	RW	Disabled..Enabled	Disabled	
G2.35	14627	Armature Over Voltage Status	RO	Off..On	Off	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
G2.36	14628	Motor Over Speed Status	RO	Off..On	Off	
G3.01	14721	Field Enable	ICR	Disabled..Enabled	Disabled	
G3.02	14722	Loop Mode	ICR	Open..Closed	Closed	
G3.03	14723	Open Loop Reference	RW	0.00..100.00%	0.00%	
G3.04	14724	Field Economy Enable	RW	Disabled..Enabled	Enabled	
G3.05	14725	In Field Economy	RO	No..Yes	No	
G3.06	14726	Field Economy Ratio	RW	0.00%..100.00%	60.00%	
G3.07	14727	Field IFB Raw	RO	0..4095	0	
G3.08	14728	Field IFB	RO	0.00..100.00%	0.00%	
G3.09	14729	Filtered Field IFB	RO	0.00..100.00%	0.00%	
G3.10	14730	Field Amps	RO	Varies by Model	0.00A	
G3.11	14731	Field VFB Raw	RO	0..4095	0	
G3.12	14732	Field VFB	RO	0.00..100.00%	0.00%	
G3.13	14733	Field VFB {Filtered}	RO	0.00..100.00%	0.00%	
G3.14	14734	Field Voltage	RO	0..400V	0V	
G3.15	14735	Max Field Current Demand	RO	0.00..100.00%	0.00%	
G3.16	14736	Min Field Current Demand	RO	0.00..100.00%	0.00%	
G3.17	14737	Final Field Current Demand	RO	0.00..100.00%	0.00%	
G3.18	14738	Field Error	RO	-100.00..100.00%	0.00%	
G3.19	14739	Field Crossover Setpoint	RW	50.00..95.00%	85.00%	
G3.20	14740	Field Crossover Output	RO	0.00..100.00%	0.00%	
G3.21	14741	Prop Gain	RW	0.000..10.000	1.250	
G3.22	14742	Integral Time	RW	0.00..10.000	0.200Secs	
G3.23	14743	Reserved	-	-	-	
G3.24	14744	Reference Select	ICR	Normal..Step..Aux	Normal	
G3.25	14745	Step Reference	RW	0.00..100.00%	0.00%	
G3.26	14746	Step Duration	RW	0.0..20.0Secs	5.0Secs	
G3.27	14747	Step Enable	RW	Disabled..Enabled	Disabled	
G3.28	14748	Field Conduction	RO	0.00..100.00%	0.00%	
G3.29	14749	Field Conduction Raw	RO	0..65535	0	
G3.30	14750	Field Sync Phase	RO	None..A..B..C	None	
G3.31	14751	Field Over Voltage Alarm Status	RO	Off..On	Off	
G3.32	14752	Field Over Current Alarm Status	RO	Off..On	Off	
G3.33	14753	Auxiliary Field Reference	RW	0.00..100.00%	0.00%	
G3.34	14754	Field Current Feedback Offset	ICR	-10.00..10.00%	0.00%	
H1.01	16513	Logic Select	ICR	Mom..MainRD..MainFR	MainRD	
H1.02	16514	Start-Run Forward	RW	Off..On	Off	
H1.03	16515	/Stop-Run Reverse	RW	Off..On	On	
H1.04	16516	Jog-Jog Forward	RW	Off..On	Off	
H1.05	16517	Reverse-Jog Reverse	RW	Off..On	Off	
H1.06	16518	Jog Delay	RW	0.0..10.0Secs	3.0Secs	
H1.07	16519	Safe Start Mode	ICR	Disabled..Enabled	Disabled	
H1.08	16520	/Coast Stop	RW	Off..On	On	
H1.09	16521	/Quick Stop	RW	Off..On	On	
H1.10	16522	/Dynamic Brake Stop	RW	Off..On	On	
H1.11	16523	Run Overrides Jog	RW	Disabled..Enabled	Disabled	
H1.12	16524	External Run Enable	RO	Disabled..Enabled	Disabled	
H1.13	16525	Run Status	RO	Off..On	Off	
H1.14	16526	Jog Status	RO	Off..On	Off	
H1.15	16527	Direction Status	RO	Fwd..Rev	Fwd	
H1.16	16528	Armature Pilot	RO	Off..On	Off	
H1.17	16529	Ref Enable	RO	Disabled..Enabled	Disabled	
H1.18	16530	Ramp Enable	RO	Disabled..Enabled	Disabled	
H1.19	16531	Loop Enable	RO	Disabled..Enabled	Disabled	
H1.20	16532	Drive Mode	RO	Refer to page 54	-	
H1.21	16533	Internal Ref Select	RO	A..B..C..D..Jog..Local	A	
H2.01	16641	In Local Mode	ICR	Off..On	Off	
H2.02	16642	Local Options	ICR	Refer to page 55	LSS/LREF	
H2.03	16643	Local Run Cmd	RO	Off..On	Off	
H2.04	16644	Local Jog Cmd	RO	Off..On	Off	
H2.05	16645	Local Direction Cmd	RO	Fwd..Rev	Fwd	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
H2.06	16646	Local Remote Button Enable	ICR	Disabled..Enabled	Enabled	
H2.07	16647	Dir Button Enable	ICR	Disabled..Enabled	Enabled	
I1.01	18561	Auxiliary Reference Enable	RW	Disabled..Enabled	Enabled	
I1.02	18562	Reference Select (MSB)	RW	Off..On	Off	
I1.03	18563	Reference Select (LSB)	RW	Off..On	Off	
I1.04	18564	Reference A	RW	-300.00%..300.00%	0.00%	
I1.05	18565	Reference B	RW	-300.00%..300.00%	10.00%	
I1.06	18566	Reference C	RW	-300.00%..300.00%	15.00%	
I1.07	18567	Reference D	RW	-300.00%..300.00%	20.00%	
I1.08	18568	Jog Reference	RW	-300.00%..300.00%	5.00%	
I1.09	18569	Local Reference	RW	-300.00%..300.00%	0.00%	
I1.10	18570	Reference	RO	-300.00%..300.00%	0.00%	
I2.01	18689	Multiplier A	RW	-300.00%..300.00%	100.00%	
I2.02	18690	Setpoint B	RW	-300.00%..300.00%	0.00%	
I2.03	18691	Multiplier B	RW	-300.00%..300.00%	100.00%	
I2.04	18692	Setpoint C	RW	-300.00%..300.00%	0.00%	
I2.05	18693	Multiplier C	RW	-300.00%..300.00%	100.00%	
I2.06	18694	Setpoint D	RW	-300.00%..300.00%	0.00%	
I2.07	18695	Multiplier D	RW	-300.00%..300.00%	100.00%	
J1.01	20609	A: Forward Accel Time	RW	0.1..600.0Secs	5.0Secs	
J1.02	20610	A: Forward Decel Time	RW	0.1..600.0Secs	5.0Secs	
J1.03	20611	A: Reverse Accel Time	RW	0.1..600.0Secs	5.0Secs	
J1.04	20612	A: Reverse Decel Time	RW	0.1..600.0Secs	5.0Secs	
J1.05	20613	A: S Accel Start Time	RW	0.0..10.0Secs	0.0Secs	
J1.06	20614	A: S Accel End Time	RW	0.0..10.0Secs	0.0Secs	
J1.07	20615	A: S Decel Start Time	RW	0.0..10.0Secs	0.0Secs	
J1.08	20616	A: S Decel End Time	RW	0.0..10.0Secs	0.0Secs	
J1.09	20617	B: Forward Accel Time	RW	0.1..600.0Secs	5.0Secs	
J1.10	20618	B: Forward Decel Time	RW	0.1..600.0Secs	5.0Secs	
J1.11	20619	B: Reverse Accel Time	RW	0.1..600.0Secs	5.0Secs	
J1.12	20620	B: Reverse Decel Time	RW	0.1..600.0Secs	5.0Secs	
J1.13	20621	B: S Accel Start Time	RW	0.0..10.0Secs	0.0Secs	
J1.14	20622	B: S Accel End Time	RW	0.0..10.0Secs	0.0Secs	
J1.15	20623	B: S Decel Start Time	RW	0.0..10.0Secs	0.0Secs	
J1.16	20624	B: S Decel End Time	RW	0.0..10.0Secs	0.0Secs	
J1.17	20625	Ramp Select	RW	A..B	A	
J1.18	20626	Ramp Bypass	RW	Off..On	Off	
J1.19	20627	Ramp Threshold	RW	0.00..100.00%	1.00%	
J1.20	20628	Ramp Input	RO	-300.00%..300.00%	0.00%	
J1.21	20629	Ramp Output	RO	-300.00%..300.00%	0.00%	
J1.22	20630	Ramping Status	RO	Off..On	Off	
J1.23	20631	Reserved	-	-	-	
J2.01	20737	A: Forward Accel Time	RW	0.1..600.0Secs	5.0Secs	
J2.02	20738	A: Forward Decel Time	RW	0.1..600.0Secs	5.0Secs	
J2.03	20739	A: Reverse Accel Time	RW	0.1..600.0Secs	5.0Secs	
J2.04	20740	A: Reverse Decel Time	RW	0.1..600.0Secs	5.0Secs	
J2.05	20741	A: S Accel Start Time	RW	0.0..10.0Secs	0.0Secs	
J2.06	20742	A: S Accel End Time	RW	0.0..10.0Secs	0.0Secs	
J2.07	20743	A: S Decel Start Time	RW	0.0..10.0Secs	0.0Secs	
J2.08	20744	A: S Decel End Time	RW	0.0..10.0Secs	0.0Secs	
J2.09	20745	B: Forward Accel Time	RW	0.1..600.0Secs	5.0Secs	
J2.10	20746	B: Forward Decel Time	RW	0.1..600.0Secs	5.0Secs	
J2.11	20747	B: Reverse Accel Time	RW	0.1..600.0Secs	5.0Secs	
J2.12	20748	B: Reverse Decel Time	RW	0.1..600.0Secs	5.0Secs	
J2.13	20749	B: S Accel Start Time	RW	0.0..10.0Secs	0.0Secs	
J2.14	20750	B: S Accel End Time	RW	0.0..10.0Secs	0.0Secs	
J2.15	20751	B: S Decel Start Time	RW	0.0..10.0Secs	0.0Secs	
J2.16	20752	B: S Decel End Time	RW	0.0..10.0Secs	0.0Secs	
J2.17	20753	Ramp Select	RW	A..B	A	
J2.18	20754	Ramp Bypass	RW	Off..On	Off	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
J2.19	20755	Ramp Threshold	RW	0.00..100.00%	1.00%	
J2.20	20756	Ramp Input	RW	-300.00%..300.00%	0.00%	
J2.21	20757	Ramp Output	RO	-300.00%..300.00%	0.00%	
J2.22	20758	Ramping Status	RO	Off..On	Off	
J2.23	20759	Ramping Enable	RW	Disabled..Enabled	Enabled	
K1.01	22657	Feedback Loss Enable	RW	Disabled..Enabled	Enabled	
K1.02	22658	Feedback Loss Level	RW	0.00..100.00%	55.00%	
K1.03	22659	Field Loss Enable	RW	Disabled..Enabled	Enabled	
K1.04	22660	Field Loss Level	RW	0.00..100.00%	2.00%	
K1.05	22661	Field Over Voltage Enable	RW	Disabled..Enabled	Enabled	
K1.06	22662	Field Over Voltage Level	RW	100.00..150.00%	110.00%	
K1.07	22663	Field Over Voltage Time	RW	1..60Mins	10Mins	
K1.08	22664	Field Over Current Enable	RW	Disabled..Enabled	Enabled	
K1.09	22665	Field Overcurrent Level	RW	100.00..150.00%	110.00%	
K1.10	22666	Field Overcurrent Time	RW	1..60Mins	10Mins	
K1.11	22667	Armature I Foldback Time	RW	0.0..60.0Secs	15.0Secs	
K1.12	22668	Armature Overcurrent Time	RW	0.0..240.0Secs	45.0Secs	
K1.13	22669	Motor Overspeed Level	RW	0.00..125.00%	125.00%	
K1.14	22670	External Fault	RW	Off..On	Off	
K1.15	22671	External Fault Reset	RW	Off..On	Off	
K1.16	22672	Software Fault Reset	RW	Off..On	Off	
K1.17	22673	Keypad Disconnect Fault Enable	RW	Disabled..Enabled	Disabled	
K1.18	22674	Phase Loss Time	RW	0.030..0.250Secs	0.055Secs	
K2.01	22785	Power On Reset	RO	Off..On	On	
K2.02	22786	Internal Fault Reset	RO	Off..On	Off	
K2.03	22787	Active Fault Register 1	RO	0..65535	0	
K2.04	22788	Active Fault Register 2	RO	0..65535	0	
K2.05	22789	Latched Faults Register 1	RO	0..65535	0	
K2.06	22790	Latched Faults Register 2	RO	0..65535	0	
K2.07	22791	Fault Code	RO	Refer to page 111	None	
K2.08	22792	Drive Faulted	RO	No..Yes	No	
K2.09	22793	Field Fault	RO	No..Yes	No	
K2.10	22794	Drive Ready	RO	No..Yes	No	
K2.11	22795	Active Alarms Register 1	RO	0..65535	0	
K2.12	22796	Active Alarms Register 2	RO	0..65535	0	
K2.13	22797	Alarm Code	RO	Refer to page 65	None	
K3.01	22913	Most Recent Fault	RO	Refer to page 111	None	
K3.02	22914	2nd Most Recent Fault	RO	Refer to page 111	None	
K3.03	22915	3rd Most Recent Fault	RO	Refer to page 111	None	
K3.04	22916	4th Most Recent Fault	RO	Refer to page 111	None	
K3.05	22917	5th Most Recent Fault	RO	Refer to page 111	None	
K3.06	22918	6th Most Recent Fault	RO	Refer to page 111	None	
K3.07	22919	7th Most Recent Fault	RO	Refer to page 111	None	
K3.08	22920	8th Most Recent Fault	RO	Refer to page 111	None	
K3.09	22921	9th Most Recent Fault	RO	Refer to page 111	None	
K3.10	22922	10th Most Recent Fault	RO	Refer to page 111	None	
K3.11	22923	Clear Fault Log	RW	No..Yes	No	
K4.01	23041	Fault	RO	Refer to page 111	None	
K4.02	23042	Armature Volts	RO	-600..600V	0V	
K4.03	23043	Armature Amps	RO	Varies by Model	0A	
K4.04	23044	Field Volts	RO	0..400	0V	
K4.05	23045	Field Amps	RO	Varies by Model	0A	
K4.06	23046	Reference	RO	-300.00..300.00%	0.00%	
K4.07	23047	Ramp Output	RO	-300.00..300.00%	0.00%	
K4.08	23048	Final Velocity Demand	RO	-105.00..105.00%	0.00%	
K4.09	23049	Velocity Feedback	RO	-125.00..125.00%	0.00%	
K4.10	23050	Final Armature Current Demand	RO	-150.00..150.00%	0.00%	
K4.11	23051	Armature Current Feedback	RO	-150.00..150.00%	0.00%	
K4.12	23052	Conduction	RO	-100.00..100.00%	0.00%	
K4.13	23053	Final Field Current Demand	RO	0.00..100.00%	0.00%	
K4.14	23054	Field Current Feedback	RO	0.00..100.00%	0.00%	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
K4.15	23055	Field Conduction	RO	0.00..100.00%	0.00%	
K4.16	23056	Drive Mode	RO	Refer to page 54	-	
K4.17	23057	Clear Fault Capture	RW	No..Yes	No	
L1.01	24705	PID Enable	RW	Disabled..Enabled	Disabled	
L1.02	24706	PID Reset	RW	Off..On	Off	
L1.03	24707	Proportional Gain	RW	0.00..50.00	5.00	
L1.04	24708	Integral Time	RW	0.010..60.000Secs	10.000Secs	
L1.05	24709	Derivative Gain	RW	0.000..50.000	0.000	
L1.06	24710	Deadband	RW	0.00..30.00%	0.00%	
L1.07	24711	Integral Clamp	RW	Off..On	Off	
L1.08	24712	Integral Hold	RW	Off..On	Off	
L1.09	24713	Integral Mode	RW	Classical..Linear	Linear	
L1.10	24714	Max Output	RW	0.00..100.00%	100.00%	
L1.11	24715	Min Output	RW	-100.00..0.00%	-100.00%	
L1.12	24716	Controller Action	RW	Err=Sp-Fb..Err=Fb-Sp	Err=Sp-Fb	
L1.13	24717	Setpoint	RW	-100.00..100.00%	0.00%	
L1.14	24718	Feedback	RW	-100.00..100.00%	0.00%	
L1.15	24719	Error	RO	-300.00..300.00%	0.00%	
L1.16	24720	Proportional Status	RO	-100.00..100.00%	0.00%	
L1.17	24721	Integral Status	RO	-100.00..100.00%	0.00%	
L1.18	24722	Derivative Status	RO	-100.00..100.00%	0.00%	
L1.19	24723	PID Saturation	RO	Off..On	Off	
L1.20	24724	Initial PID Output	RO	-100.00..100.00%	0.00%	
L1.21	24725	PID Trim	RW	-100.00..100.00%	10.00%	
L1.22	24726	Trim Output	RO	-100.00..100.00%	0.00%	
L1.23	24727	PID Scale	RW	-100.00..100.00%	0.00%	
L1.24	24728	PID Min Scale	RW	-100.00..100.00%	10.00%	
L1.25	24729	Output	RO	-100.00..100.00%	0.00%	
L2.01	24833	Diameter Select	ICR	None..Ext..Roll..Line..L/R	None	
L2.02	24834	Core Diameter	RW	0.01..600.00"	1.00"	
L2.03	24835	Max Diameter	RW	0.01..600.00"	10.00"	
L2.04	24836	Material Thickness	RW	0.0001..6.0000"	0.0001"	
L2.05	24837	Revolutions	RW	0..65535	0	
L2.06	24838	Circumference	RW	0.01..300.00"	0.01"	
L2.07	24839	External Diameter Ratio	RW	0.00..100.00%	0.00%	
L2.08	24840	External Roll Speed	RW	-100.00..100.00%	0.00%	
L2.09	24841	Core Speed	RW	0.00..100.00%	0.00%	
L2.10	24842	Effective Roll Speed	RO	0.00..100.00%	0.00%	
L2.11	24843	Diameter Memory	RW	Disabled..Enabled	Disabled	
L2.12	24844	Core/Dia Ratio	RO	0.00..100.00%	0.00%	
L2.13	24845	Diameter/Max Ratio	RO	0.00..100.00%	0.00%	
L2.14	24846	Diameter	RO	0.00..600.00"	1.00"	
L3.01	24961	Line Speed	RW	-100.00..100.00%	0.00%	
L3.02	24962	Line Speed Sum	RW	-100.00..100.00%	0.00%	
L3.03	24963	Roll Speed Sum	RW	-100.00..100.00%	0.00%	
L3.04	24964	Roll Speed	RO	-100.00..100.00%	0.00%	
L4.01	25089	Tension Setpoint	RW	0.00..100.00%	0.00%	
L4.02	25090	Taper Diameter	RW	0.01..600.00"	600.00"	
L4.03	25091	Taper Percentage	RW	0.00..100.00%	0.00%	
L4.04	25092	Tension Demand	RO	0.00..100.00%	0.00%	
L5.01	25217	Diameter Torque Gain	RW	0.00..300.00%	100.00%	
L5.02	25218	Diameter Torque	RO	0.00..100.00%	0.00%	
L5.03	25219	Inertia Mode	RW	Accel..Decel	Accel	
L5.04	25220	Inertia Sensitivity	RW	1..10	5	
L5.05	25221	Inertia Compensation	RW	0.00..100.00%	0.00%	
L5.06	25222	Line Speed Status	RO	Decel..AtSpeed..Accel	AtSpeed	
L5.07	25223	Inertia Torque	RO	0.00..100.00%	0.00%	
L5.08	25224	Friction Compensation	RW	0.00..100.00%	0.00%	
L5.09	25225	Friction Torque	RO	0.00..100.00%	0.00%	
L5.10	25226	Static Friction Torque	RW	0.00..100.00%	0.00%	
L5.11	25227	Pulse Threshold	RW	0.00..100.00%	0.00%	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
L5.12	25228	Pulse Torque Level	RW	0.00..100.00%	0.00%	
L5.13	25229	Pulse Torque Time	RW	0.0..10.0Secs	0.5Secs	
L5.14	25230	Pulse Torque	RO	0.00..100.00%	0.00%	
L5.15	25231	Torque Sum	RW	0.00..100.00%	0.00%	
L5.16	25232	Total Torque	RO	0.00..100.00%	0.00%	
L6.01	25345	MOP Increase	RW	Off..On	Off	
L6.02	25346	MOP Decrease	RW	Off..On	Off	
L6.03	25347	MOP Increase Time	RW	0.1..600.0Secs	10.0Secs	
L6.04	25348	MOP Decrease Time	RW	0.1..600.0Secs	10.0Secs	
L6.05	25349	MOP Max Value	RW	-300.00..300.00%	100.00%	
L6.06	25350	MOP Min Value	RW	-300.00..300.00%	0.00%	
L6.07	25351	MOP Reset	RW	Off..On	Off	
L6.08	25352	MOP Reset Value	RW	-300.00..300.00%	0.00%	
L6.09	25353	MOP Output	RO	-300.00..300.00%	0.00%	
L7.01	25473	Taper Speed Reference	RW	-100.00..100.00%	0.00%	
L7.02	25474	Core Torque Threshold	RW	0..300.00%	300.00%	
L7.03	25475	Taper (Gain)	RW	0..300.00	300.00	
L7.04	25476	Taper Speed Demand	RO	-100.00..100.00%	0.00%	
L7.05	25477	Taper Output	RO	-100.00..100.00%	0.00%	
L7.06	25478	In Torque Limit	RO	No..Yes	No	
M1.01	26753	Threshold 1 Input	RW	-300.00..300.00%	0.00%	
M1.02	26754	Threshold 1 Absolute Value	RW	Off..On	Off	
M1.03	26755	Threshold 1 On Level	RW	-300.00..300.00%	50.00%	
M1.04	26756	Threshold 1 Off Level	RW	-300.00..300.00%	40.00%	
M1.05	26757	Threshold 1 On Value	RW	-300.00..300.00%	100.00%	
M1.06	26758	Threshold 1 Off Value	RW	-300.00..300.00%	0.00%	
M1.07	26759	Threshold 1 Status	RO	Off..On	Off	
M1.08	26760	Threshold 1 Output	RO	-300.00..300.00%	0.00%	
M2.01	26881	Threshold 2 Input	RW	-300.00..300.00%	0.00%	
M2.02	26882	Threshold 2 Absolute Value	RW	Off..On	Off	
M2.03	26883	Threshold 2 On Level	RW	-300.00..300.00%	50.00%	
M2.04	26884	Threshold 2 Off Level	RW	-300.00..300.00%	40.00%	
M2.05	26885	Threshold 2 On Value	RW	-300.00..300.00%	100.00%	
M2.06	26886	Threshold 2 Off Value	RW	-300.00..300.00%	0.00%	
M2.07	26887	Threshold 2 Status	RO	Off..On	Off	
M2.08	26888	Threshold 2 Output	RO	-300.00..300.00%	0.00%	
M3.01	27009	Threshold 3 Input	RW	-300.00..300.00%	0.00%	
M3.02	27010	Threshold 3 Absolute Value	RW	Off..On	Off	
M3.03	27011	Threshold 3 On Level	RW	-300.00..300.00%	50.00%	
M3.04	27012	Threshold 3 Off Level	RW	-300.00..300.00%	40.00%	
M3.05	27013	Threshold 3 On Value	RW	-300.00..300.00%	100.00%	
M3.06	27014	Threshold 3 Off Value	RW	-300.00..300.00%	0.00%	
M3.07	27015	Threshold 3 Status	RO	Off..On	Off	
M3.08	27016	Threshold 3 Output	RO	-300.00..300.00%	0.00%	
M4.01	27137	Threshold 4 Input	RW	-300.00..300.00%	0.00%	
M4.02	27138	Threshold 4 Absolute Value	RW	Off..On	Off	
M4.03	27139	Threshold 4 On Level	RW	-300.00..300.00%	50.00%	
M4.04	27140	Threshold 4 Off Level	RW	-300.00..300.00%	40.00%	
M4.05	27141	Threshold 4 On Value	RW	-300.00..300.00%	100.00%	
M4.06	27142	Threshold 4 Off Value	RW	-300.00..300.00%	0.00%	
M4.07	27143	Threshold 4 Status	RO	Off..On	Off	
M4.08	27144	Threshold 4 Output	RO	-300.00..300.00%	0.00%	
M5.01	27265	Threshold 5 Input	RW	-300.00..300.00%	0.00%	
M5.02	27266	Threshold 5 Absolute Value	RW	Off..On	Off	
M5.03	27267	Threshold 5 On Level	RW	-300.00..300.00%	50.00%	
M5.04	27268	Threshold 5 Off Level	RW	-300.00..300.00%	40.00%	
M5.05	27269	Threshold 5 On Value	RW	-300.00..300.00%	100.00%	
M5.06	27270	Threshold 5 Off Value	RW	-300.00..300.00%	0.00%	
M5.07	27270	Threshold 5 Status	RO	Off..On	Off	
M5.08	27272	Threshold 5 Output	RO	-300.00..300.00%	0.00%	
M6.01	27393	Threshold 6 Input	RW	-300.00..300.00%	0.00%	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
M6.02	27394	Threshold 6 Absolute Value	RW	Off..On	Off	
M6.03	27395	Threshold 6 On Level	RW	-300.00..300.00%	50.00%	
M6.04	27396	Threshold 6 Off Level	RW	-300.00..300.00%	40.00%	
M6.05	27397	Threshold 6 On Value	RW	-300.00..300.00%	100.00%	
M6.06	27398	Threshold 6 Off Value	RW	-300.00..300.00%	0.00%	
M6.07	27399	Threshold 6 Status	RO	Off..On	Off	
M6.08	27400	Threshold 6 Output	RO	-300.00..300.00%	0.00%	
M7.01	27521	Threshold 7 Enable	RW	Disabled..Enabled	Disabled	
M7.02	27522	Threshold 7 Input	RW	-300.00..300.00%	0.00%	
M7.03	27523	Threshold 7 Upper Limit	RW	-300.00..300.00%	90.00%	
M7.04	27524	Threshold 7 Lower Limit	RW	-300.00..300.00%	10.00%	
M7.05	27525	Threshold 7 Delay Time	RW	0.0..60.0Secs	0.0Secs	
M7.06	27526	Threshold 7 Reset Mode	RW	Manual..Auto	Manual	
M7.07	27527	Threshold 7 Manual Reset	RW	Off..On	Off	
M7.08	27528	Threshold 7 Upper Limit Exceeded	RO	Off..On	Off	
M7.09	27529	Threshold 7 Lower Limit Exceeded	RO	Off..On	Off	
M7.10	27530	Threshold 7 Limit Exceeded	RO	Off..On	Off	
M8.01	27649	Threshold 8 Enable	RW	Disabled..Enabled	Disabled	
M8.02	27650	Threshold 8 Input	RW	-300.00..300.00%	0.00%	
M8.03	27651	Threshold 8 Upper Limit	RW	-300.00..300.00%	90.00%	
M8.04	27652	Threshold 8 Lower Limit	RW	-300.00..300.00%	10.00%	
M8.05	27653	Threshold 8 Delay Time	RW	0.0..60.0Secs	0.0Secs	
M8.06	27654	Threshold 8 Reset Mode	RW	Manual..Auto	Manual	
M8.07	27655	Threshold 8 Manual Reset	RW	Off..On	Off	
M8.08	27656	Threshold 8 Upper Limit Exceeded	RO	Off..On	Off	
M8.09	27657	Threshold 8 Lower Limit Exceeded	RO	Off..On	Off	
M8.10	27658	Threshold 8 Limit Exceeded	RO	Off..On	Off	
N1.01	28801	Timer 1 Mode	RW	Refer to page 82	OnDelay	
N1.02	28802	Timer 1 Input	RW	Off..On	Off	
N1.03	28803	Timer 1 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N1.04	28804	Timer 1 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	
N1.05	28805	Timer 1 On Value	RW	-300.00..300.00%	100.00%	
N1.06	28806	Timer 1 Off Value	RW	-300.00..300.00%	0.00%	
N1.07	28807	Timer 1 Status	RO	Stopped..Timing	Stopped	
N1.08	28808	Timer 1 Time	RO	0.0..600.0Secs	0.0Secs	
N1.09	28809	Timer 1 Output Status	RO	Off..On	Off	
N1.10	28810	Timer 1 Output	RO	-300.00..300.00%	0.00%	
N2.01	28929	Timer 2 Mode	RW	Refer to page 82	OnDelay	
N2.02	28930	Timer 2 Input	RW	Off..On	Off	
N2.03	28931	Timer 2 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N2.04	28932	Timer 2 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	
N2.05	28933	Timer 2 On Value	RW	-300.00..300.00%	100.00%	
N2.06	28934	Timer 2 Off Value	RW	-300.00..300.00%	0.00%	
N2.07	28935	Timer 2 Status	RO	Stopped..Timing	Stopped	
N2.08	28936	Timer 2 Time	RO	0.0..600.0Secs	0.0Secs	
N2.09	28937	Timer 2 Output Status	RO	Off..On	Off	
N2.10	28938	Timer 2 Output	RO	-300.00..300.00%	0.00%	
N3.01	29057	Timer 3 Mode	RW	Refer to page 82	OnDelay	
N3.02	29058	Timer 3 Input	RW	Off..On	Off	
N3.03	29059	Timer 3 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N3.04	29060	Timer 3 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	
N3.05	29061	Timer 3 On Value	RW	-300.00..300.00%	100.00%	
N3.06	29062	Timer 3 Off Value	RW	-300.00..300.00%	0.00%	
N3.07	29063	Timer 3 Status	RO	Stopped..Timing	Stopped	
N3.08	29064	Timer 3 Time	RO	0.0..600.0Secs	0.0Secs	
N3.09	29065	Timer 3 Output Status	RO	Off..On	Off	
N3.10	29066	Timer 3 Output	RO	-300.00..300.00%	0.00%	
N4.01	29185	Timer 4 Mode	RW	Refer to page 82	OnDelay	
N4.02	29186	Timer 4 Input	RW	Off..On	Off	
N4.03	29187	Timer 4 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N4.04	29188	Timer 4 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
N4.05	29189	Timer 4 On Value	RW	-300.00..300.00%	100.00%	
N4.06	29190	Timer 4 Off Value	RW	-300.00..300.00%	0.00%	
N4.07	29191	Timer 4 Status	RO	Stopped..Timing	Stopped	
N4.08	29192	Timer 4 Time	RO	0.0..600.0Secs	0.0Secs	
N4.09	29193	Timer 4 Output Status	RO	Off..On	Off	
N4.10	29194	Timer 4 Output	RO	-300.00..300.00%	0.00%	
N5.01	29313	Timer 5 Mode	RW	Refer to page 82	OnDelay	
N5.02	29314	Timer 5 Input	RW	Off..On	Off	
N5.03	29315	Timer 5 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N5.04	29316	Timer 5 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	
N5.05	29317	Timer 5 On Value	RW	-300.00..300.00%	100.00%	
N5.06	29318	Timer 5 Off Value	RW	-300.00..300.00%	0.00%	
N5.07	29319	Timer 5 Status	RO	Stopped..Timing	Stopped	
N5.08	29320	Timer 5 Time	RO	0.0..600.0Secs	0.0Secs	
N5.09	29321	Timer 5 Output Status	RO	Off..On	Off	
N5.10	29322	Timer 5 Output	RO	-300.00..300.00%	0.00%	
N6.01	29441	Timer 6 Mode	RW	Refer to page 82	OnDelay	
N6.02	29442	Timer 6 Input	RW	Off..On	Off	
N6.03	29443	Timer 6 Delay Time 1	RW	0.1..600.0Secs	5.0Secs	
N6.04	29444	Timer 6 Delay Time 2	RW	0.1..600.0Secs	5.0Secs	
N6.05	29445	Timer 6 On Value	RW	-300.00..300.00%	100.00%	
N6.06	29446	Timer 6 Off Value	RW	-300.00..300.00%	0.00%	
N6.07	29447	Timer 6 Status	RO	Stopped..Timing	Stopped	
N6.08	29448	Timer 6 Time	RO	0.0..600.0Secs	0.0Secs	
N6.09	29449	Timer 6 Output Status	RO	Off..On	Off	
N6.10	29450	Timer 6 Output	RO	-300.00..300.00%	0.00%	
O1.01	30849	Logic Gate 1 Mode	RW	Refer to page 84	A and B	
O1.02	30850	Logic Gate 1 Input A	RW	Varies by Mode	False	
O1.03	30851	Logic Gate 1 Input B	RW	Varies by Mode	False	
O1.04	30852	Logic Gate 1 Output	RO	Varies by Mode	False	
O2.01	30977	Logic Gate 2 Mode	RW	Refer to page 84	A and B	
O2.02	30978	Logic Gate 2 Input A	RW	Varies by Mode	False	
O2.03	30979	Logic Gate 2 Input B	RW	Varies by Mode	False	
O2.04	30980	Logic Gate 2 Output	RO	Varies by Mode	False	
O3.01	31105	Logic Gate 3 Mode	RW	Refer to page 84	A and B	
O3.02	31106	Logic Gate 3 Input A	RW	Varies by Mode	False	
O3.03	31107	Logic Gate 3 Input B	RW	Varies by Mode	False	
O3.04	31108	Logic Gate 3 Output	RO	Varies by Mode	False	
O4.01	31233	Logic Gate 4 Mode	RW	Refer to page 84	A and B	
O4.02	31234	Logic Gate 4 Input A	RW	Varies by Mode	False	
O4.03	31235	Logic Gate 4 Input B	RW	Varies by Mode	False	
O4.04	31236	Logic Gate 4 Output	RO	Varies by Mode	False	
O5.01	31361	Logic Gate 5 Mode	RW	Refer to page 84	A and B	
O5.02	31362	Logic Gate 5 Input A	RW	Varies by Mode	False	
O5.03	31363	Logic Gate 5 Input B	RW	Varies by Mode	False	
O5.04	31364	Logic Gate 5 Output	RO	Varies by Mode	False	
O6.01	31489	Logic Gate 6 Mode	RW	Refer to page 84	A and B	
O6.02	31490	Logic Gate 6 Input A	RW	Varies by Mode	False	
O6.03	31491	Logic Gate 6 Input B	RW	Varies by Mode	False	
O6.04	31492	Logic Gate 6 Output	RO	Varies by Mode	False	
P1.01	32897	Logic Switch 1 Coil	RW	Off..On	Off	
P1.02	32898	Logic Switch 1 Input A	RW	-327.68..327.68%	0.00%	
P1.03	32899	Logic Switch 1 Input B	RW	-327.68..327.68%	0.00%	
P1.04	32900	Logic Switch 1 Output	RO	-327.68..327.68%	0.00%	
P2.01	33025	Logic Switch 2 Coil	RW	Off..On	Off	
P2.02	33026	Logic Switch 2 Input A	RW	-327.68..327.68%	0.00%	
P2.03	33027	Logic Switch 2 Input B	RW	-327.68..327.68%	0.00%	
P2.04	33028	Logic Switch 2 Output	RO	-327.68..327.68%	0.00%	
P3.01	33153	Logic Switch 3 Coil	RW	Off..On	Off	
P3.02	33154	Logic Switch 3 Input A	RW	-327.68..327.68%	0.00%	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
P3.03	33155	Logic Switch 3 Input B	RW	-327.68..327.68%	0.00%	
P3.04	33156	Logic Switch 3 Output	RO	-327.68..327.68%	0.00%	
P4.01	33281	Logic Switch 4 Coil	RW	Off..On	Off	
P4.02	33282	Logic Switch 4 Input A	RW	-327.68..327.68%	0.00%	
P4.03	33283	Logic Switch 4 Input B	RW	-327.68..327.68%	0.00%	
P4.04	33284	Logic Switch 4 Output	RO	-327.68..327.68%	0.00%	
P5.01	33409	Logic Switch 5 Coil	RW	Off..On	Off	
P5.02	33410	Logic Switch 5 Input A	RW	-327.68..327.68%	0.00%	
P5.03	33411	Logic Switch 5 Input B	RW	-327.68..327.68%	0.00%	
P5.04	33412	Logic Switch 5 Output	RO	-327.68..327.68%	0.00%	
P6.01	33537	Logic Switch 6 Coil	RW	Off..On	Off	
P6.02	33538	Logic Switch 6 Input A	RW	-327.68..327.68%	0.00%	
P6.03	33539	Logic Switch 6 Input B	RW	-327.68..327.68%	0.00%	
P6.04	33540	Logic Switch 6 Output	RO	-327.68..327.68%	0.00%	
Q1.01	34945	Internal Link 1 Source	ICR	A1.01..U1.20	J1.21	
Q1.02	34946	Internal Link 1 Destination	ICR	A1.01..U1.20	G1.20	
Q1.03	34947	Internal Link 2 Source	ICR	A1.01..U1.20	J1.21	
Q1.04	34948	Internal Link 2 Destination	ICR	A1.01..U1.20	G1.02	
Q1.05	34949	Internal Link 3 Source	ICR	A1.01..U1.20	00.00	
Q1.06	34950	Internal Link 3 Destination	ICR	A1.01..U1.20	00.00	
Q1.07	34951	Internal Link 4 Source	ICR	A1.01..U1.20	00.00	
Q1.08	34952	Internal Link 4 Destination	ICR	A1.01..U1.20	00.00	
Q1.09	34953	Internal Link 5 Source	ICR	A1.01..U1.20	00.00	
Q1.10	34954	Internal Link 5 Destination	ICR	A1.01..U1.20	00.00	
Q1.11	34955	Internal Link 6 Source	ICR	A1.01..U1.20	00.00	
Q1.12	34956	Internal Link 6 Destination	ICR	A1.01..U1.20	00.00	
Q1.13	34957	Internal Link 7 Source	ICR	A1.01..U1.20	00.00	
Q1.14	34958	Internal Link 7 Destination	ICR	A1.01..U1.20	00.00	
Q1.15	34959	Internal Link 8 Source	ICR	A1.01..U1.20	00.00	
Q1.16	34960	Internal Link 8 Destination	ICR	A1.01..U1.20	00.00	
Q1.17	34961	Internal Link 9 Source	ICR	A1.01..U1.20	00.00	
Q1.18	34962	Internal Link 9 Destination	ICR	A1.01..U1.20	00.00	
Q1.19	34963	Internal Link 10 Source	ICR	A1.01..U1.20	00.00	
Q1.20	34964	Internal Link 10 Destination	ICR	A1.01..U1.20	00.00	
Q2.01	35073	Internal Link 11 Source	ICR	A1.01..U1.20	00.00	
Q2.02	35074	Internal Link 11 Destination	ICR	A1.01..U1.20	00.00	
Q2.03	35075	Internal Link 12 Source	ICR	A1.01..U1.20	00.00	
Q2.04	35076	Internal Link 12 Destination	ICR	A1.01..U1.20	00.00	
Q2.05	35077	Internal Link 13 Source	ICR	A1.01..U1.20	00.00	
Q2.06	35078	Internal Link 13 Destination	ICR	A1.01..U1.20	00.00	
Q2.07	35079	Internal Link 14 Source	ICR	A1.01..U1.20	00.00	
Q2.08	35080	Internal Link 14 Destination	ICR	A1.01..U1.20	00.00	
Q2.09	35081	Internal Link 15 Source	ICR	A1.01..U1.20	00.00	
Q2.10	35082	Internal Link 15 Destination	ICR	A1.01..U1.20	00.00	
Q2.11	35083	Internal Link 16 Source	ICR	A1.01..U1.20	00.00	
Q2.12	35084	Internal Link 16 Destination	ICR	A1.01..U1.20	00.00	
Q2.13	35085	Internal Link 17 Source	ICR	A1.01..U1.20	00.00	
Q2.14	35086	Internal Link 17 Destination	ICR	A1.01..U1.20	00.00	
Q2.15	35087	Internal Link 18 Source	ICR	A1.01..U1.20	00.00	
Q2.16	35088	Internal Link 18 Destination	ICR	A1.01..U1.20	00.00	
Q2.17	35089	Internal Link 19 Source	ICR	A1.01..U1.20	00.00	
Q2.18	35090	Internal Link 19 Destination	ICR	A1.01..U1.20	00.00	
Q2.19	35091	Internal Link 20 Source	ICR	A1.01..U1.20	00.00	
Q2.20	35092	Internal Link 20 Destination	ICR	A1.01..U1.20	00.00	
Q3.01	35201	Internal Link 21 Source	ICR	A1.01..U1.20	00.00	
Q3.02	35202	Internal Link 21 Destination	ICR	A1.01..U1.20	00.00	
Q3.03	35203	Internal Link 22 Source	ICR	A1.01..U1.20	00.00	
Q3.04	35204	Internal Link 22 Destination	ICR	A1.01..U1.20	00.00	
Q3.05	35205	Internal Link 23 Source	ICR	A1.01..U1.20	00.00	
Q3.06	35206	Internal Link 23 Destination	ICR	A1.01..U1.20	00.00	
Q3.07	35207	Internal Link 24 Source	ICR	A1.01..U1.20	00.00	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
Q3.08	35208	Internal Link 24 Destination	ICR	A1.01..U1.20	00.00	
Q3.09	35209	Internal Link 25 Source	ICR	A1.01..U1.20	00.00	
Q3.10	35210	Internal Link 25 Destination	ICR	A1.01..U1.20	00.00	
Q3.11	35211	Internal Link 26 Source	ICR	A1.01..U1.20	00.00	
Q3.12	35212	Internal Link 26 Destination	ICR	A1.01..U1.20	00.00	
Q3.13	35213	Internal Link 27 Source	ICR	A1.01..U1.20	00.00	
Q3.14	35214	Internal Link 27 Destination	ICR	A1.01..U1.20	00.00	
Q3.15	35215	Internal Link 28 Source	ICR	A1.01..U1.20	00.00	
Q3.16	35216	Internal Link 28 Destination	ICR	A1.01..U1.20	00.00	
Q3.17	35217	Internal Link 29 Source	ICR	A1.01..U1.20	00.00	
Q3.18	35218	Internal Link 29 Destination	ICR	A1.01..U1.20	00.00	
Q3.19	35219	Internal Link 30 Source	ICR	A1.01..U1.20	00.00	
Q3.20	35220	Internal Link 30 Destination	ICR	A1.01..U1.20	00.00	
R1.01	36993	Clear Counters	RW	Off..On	Off	
R1.02	36994	Bus Message Count	RO	0..65535	0	
R1.03	36995	Bus Com Error Count	RO	0..65535	0	
R1.04	36996	Bus Exception Error Count	RO	0..65535	0	
R1.05	36997	Device Message Count	RO	0..65535	0	
R1.06	36998	Device No Response Count	RO	0..65535	0	
R1.07	36999	Break Detected Count	RO	0..65535	0	
R1.08	37000	Framing Error Count	RO	0..65535	0	
R1.09	37001	Overrun Error Count	RO	0..65535	0	
R1.10	37002	Parity Error Count	RO	0..65535	0	
R2.01	37121	Clear Counters	RW	Off..On	Off	
R2.02	37122	Bus Message Count	RO	0..65535	0	
R2.03	37123	Bus Com Error Count	RO	0..65535	0	
R2.04	37124	Bus Exception Error Count	RO	0..65535	0	
R2.05	37125	Device Message Count	RO	0..65535	0	
R2.06	37126	Device No Response Count	RO	0..65535	0	
R2.07	37127	Break Detected Count	RO	0..65535	0	
R2.08	37128	Framing Error Count	RO	0..65535	0	
R2.09	37129	Overrun Error Count	RO	0..65535	0	
R2.10	37130	Parity Error Count	RO	0..65535	0	
R2.11	37131	Keypad Status	RO	Offline..Online	Offline	
R3.01	37249	Modbus Address	RW	1..247	1	
R3.02	37250	Baud Rate	RW	2400..115200	38400	
R3.03	37251	Parity	RW	None..Odd..Even	None	
R3.04	37252	Stop Bits	RW	1..2	2	
R3.05	37253	Apply	RW	Off..On	Off	
R3.06	37254	Clear Counters	RW	Off..On	Off	
R3.07	37255	Bus Message Count	RO	0..65535	0	
R3.08	37256	Bus Com Error Count	RO	0..65535	0	
R3.09	37257	Bus Exception Error Count	RO	0..65535	0	
R3.10	37258	Device Message Count	RO	0..65535	0	
R3.11	37259	Device No Response Count	RO	0..65535	0	
R3.12	37260	Break Detected Count	RO	0..65535	0	
R3.13	37261	Framing Error Count	RO	0..65535	0	
R3.14	37262	Overrun Error Count	RO	0..65535	0	
R3.15	37263	Parity Error Count	RO	0..65535	0	
R3.16	37264	Timeout Enable	RW	Disabled..Enabled	Disabled	
R3.17	37265	Timeout Period	RW	0.0..20.0Secs	0.5Secs	
R3.18	37266	Timeout Action	RW	None..Alarm..Fault	None	
R3.19	37267	Timeout Status	RO	Error..OK	Error	
R3.20	37268	Ethernet Address Mode	RW	MANUAL..AUTO	MANUAL	
R3.21	37269	IP Address 1	RW	0..255	192	
R3.22	37270	IP Address 2	RW	0..255	168	
R3.23	37271	IP Address 3	RW	0..255	0	
R3.24	37272	IP Address 4	RW	0..255	254	
R3.25	37273	Subnet Mask 1	RW	0..255	255	
R3.26	37274	Subnet Mask 2	RW	0..255	255	
R3.27	37275	Subnet Mask 3	RW	0..255	255	

Tag	Modbus Address	Parameter Name	Access	Range	Preset	Note
R3.28	37276	Subnet Mask 4	RW	0..255	0	
R3.29	37277	Gateway Address 1	RW	0..255	192	
R3.30	37278	Gateway Address 2	RW	0..255	168	
R3.31	37279	Gateway Address 3	RW	0..255	0	
R3.32	37280	Gateway Address 4	RW	0..255	1	
R3.33	37281	TCP Client Connected Status	RO	0..1	0	
R4.01	37377	Port ID	RO	0..65535	0	
S1.01	39041	Zero Speed Setpoint	RW	0.50..25.00%	4.00%	
S1.02	39042	Standstill Enable	RW	Disabled..Enabled	Enabled	
S1.03	39043	Standstill Timer	RW	0.0..10.0Secs	0.1Secs	
S1.04	39044	At Zero Set	RO	Off..On	Off	
S1.05	39045	At Zero Demand	RO	Off..On	Off	
S1.06	39046	At Zero Speed	RO	Off..On	Off	
S1.07	39047	At Standstill	RO	Off..On	Off	
T1.01	41089	Drive Model	RO	Varies by Model	-	
T1.02	41090	Drive Rated Armature Current	RO	Varies by Model	-	
T1.03	41091	Drive Rated Field Current	RO	Varies by Model	-	
T1.04	41092	Drive Firmware Version	RO	Varies by Model	-	
T1.05	41093	Control Bd ID Raw	RO	Varies by Model	-	
T1.06	41094	Control Bd ID	RO	Varies by Model	-	
T1.07	41095	Model Type	RO	NonRegen..Regen	-	
T1.08	41096	Edit In Progress	RO	Off..On	Off	
T1.09	41097	Reset Source	RO	Ext..Wd..Software	-	
T1.10	41098	Phase Loss Status	RO	Off..On	Off	
T1.11	41099	CT ID Status	RO	0..15	0	
T1.12	41100	Heatsink Temperature Raw Status	RO	0..4095	0	
T1.13	41101	Heatsink Temperature	RO	0..150C	0C	
T1.14	41102	Heatsink Over Temperature Level	RO	0..150C	0C	
T1.15	41103	EEPROM Fault Status	RO	No Fault..Read..Write	No Fault	
T1.16	41104	EEPROM Alarm Status	RO	Refer to page 94	0	
T1.17	41105	Option Board ID Raw	RO	0..4095	0	
T1.18	41106	Option Board ID	RO	-	0	
T2.01	41217	Parameter Save	RW	Off..On	Off	
T2.02	41218	Line Frequency Select	ICR	Auto..50..60	Auto	
T2.03	41219	Line Frequency Status	RO	0..60Hz	0Hz	
T2.04	41220	Regen Enable	ICR	Disabled..Enabled	Enabled	
T2.05	41221	Fan(s) Mode	RW	Auto..On	Auto	
T2.06	41222	Fan(s) Status	RO	Off..On	Off	
U1.01	43137	Aux 1	RW	-327.68..327.67%	0.00%	
U1.02	43138	Aux 2	RW	-327.68..327.67%	0.00%	
U1.03	43139	Aux 3	RW	-327.68..327.67%	0.00%	
U1.04	43140	Aux 4	RW	-327.68..327.67%	0.00%	
U1.05	43141	Aux 5	RW	-327.68..327.67%	0.00%	
U1.06	43142	Aux 6	RW	-327.68..327.67%	0.00%	
U1.07	43143	Aux 7	RW	-327.68..327.67%	0.00%	
U1.08	43144	Aux 8	RW	-327.68..327.67%	0.00%	
U1.09	43145	Aux 9	RW	-327.68..327.67%	0.00%	
U1.10	43146	Aux 10	RW	-327.68..327.67%	0.00%	
U1.11	43147	Aux 11	RW	-327.68..327.67%	0.00%	
U1.12	43148	Aux 12	RW	-327.68..327.67%	0.00%	
U1.13	43149	Aux 13	RW	-327.68..327.67%	0.00%	
U1.14	43150	Aux 14	RW	-327.68..327.67%	0.00%	
U1.15	43151	Aux 15	RW	-327.68..327.67%	0.00%	
U1.16	43152	Aux 16	RW	-327.68..327.67%	0.00%	
U1.17	43153	Aux 17	RW	-327.68..327.67%	0.00%	
U1.18	43154	Aux 18	RW	-327.68..327.67%	0.00%	
U1.19	43155	Aux 19	RW	-327.68..327.67%	0.00%	
U1.20	43156	Aux 20	RW	-327.68..327.67%	0.00%	

Table 18: Faults

Fault	Description	Suggested Action
HARDWARE FAULT A0 (506)	Internal hardware error	Contact Carotron
HARDWARE FAULT A1 (507)		
HARDWARE FAULT A2 (508)		
HARDWARE FAULT B0 (521)	Internal hardware error	Ensure the CN6 (control board to trigger board) ribbon cable is connected properly.
		Contact Carotron
CT ID ERROR (501)	The Current Transformer Identification board is not installed on the Trigger board.	Ensure board is installed on the Trigger board correctly.
CN29 DISCONNECTED (531)	The CN29 ribbon cable connecting the Field Current Feedback board to the Trigger board is disconnected or not connected properly.	Ensure CN29 ribbon cable is connected properly. The red stripe on the ribbon cable indicates pin 1.
THERMISTOR OPEN (502)	The drive's heatsink temperature sensor (thermistor) is not connected or damaged.	Ensure the thermistor is connected properly at TB3 on the regulator board.
EEPROM READ FAULT (504)	The drive was unable to read the parameters from the EEPROM	Power down the drive for one minute and then re-apply power. If fault is still present, re-initialize drive by setting A1.02=9999. Note that this will reset all parameters to factory defaults. If fault persists, replace processor and/or control board.
EEPROM WRITE FAULT (505)	An error occurred when the drive attempted to save all of the parameters to the EEPROM.	Power down the drive for one minute and then re-apply power. If fault is still present, re-initialize drive by setting A1.02=9999. Note that this will reset all parameters to factory defaults. If fault persists, replace processor and/or control board.
INVALID MOTOR DATA (703)	Motor data has not been entered.	Program the motor data into the drive. Refer to the F1.xx parameters.
HEATSINK OVERTEMP (602)	The heatsink temperature exceeded the over temperature level.	Ensure fans are working properly.
		Ensure adequate airflow around control. If drive is mounted in an enclosure, ensure enclosure has adequate cooling.

Fault	Description	Suggested Action
KEYPAD DISCONNECT (503)	The CN9 cable from the Control board to the keypad was disconnected.	Disable this fault (See K1.17). Please note that disabling this fault only applies when the drive is in remote operation. Even when disabled, this fault will still occur if the keypad is disconnected and the drive is running in local mode.
PHASE LOSS (402)	One or more of the 3 AC line phases is missing.	Check incoming AC line fuses and wiring.
ARMATURE OVERCURRENT (201)	The motor armature current exceeded 105% for the time period defined by K1.12.	Verify motor armature current rating and ensure F1.02 is set properly. Excessive load on motor. Reduce load on motor.
ARMATURE OVERVOLTAGE (202)	The motor armature voltage exceeded 120% of the rated motor voltage (F1.03).	Verify motor armature voltage rating and ensure F1.03 is set properly. If an armature contactor is used, ensure contactor is energizing and contacts are working properly.
FIELD OVERCURRENT (103)	The motor field current exceeded the K1.09 overcurrent trip level for the amount of time defined by K1.10. (100% field current is defined by T1.03)	<u>G3.02=Open Loop</u> Ensure Field Economy is enabled (G3.04). Ensure motor blowers are functioning properly. Reduce the Field Open Loop Reference G3.03.
		<u>G3.02=Closed Loop</u> Ensure Field Economy is enabled (G3.04). Ensure motor blowers are functioning properly. Verify motor field current rating and ensure F1.04 is set properly.
FIELD OVERVOLTAGE (102)	The motor field voltage exceeded the K1.06 overvoltage trip level for the amount of time defined by K1.07.	<u>G3.02=Open Loop</u> Reduce the Field Open Loop Reference G3.03. Ensure Field Economy is enabled (G3.04).
		<u>G3.02=Closed Loop</u> Verify motor field voltage rating and ensure F1.06 is set properly. Ensure Field Economy is enabled (G3.04).

Fault	Description	Suggested Action
MOTOR OVERSPEED (302)	The motor speed exceeded the level set by K1.13. This fault is only applicable when the drive is in tachometer or encoder feedback.	<u>G2.15=Tachometer</u> Verify tachometer rating and F2.01 and F2.03 are set properly. Also ensure jumpers J1-J3 are set properly (see F2.04-F2.06). Ensure proper polarity of tachometer signal (F2.02).
		<u>G2.15=Encoder</u> Verify encoder rating and F3.01 and F3.02 are set properly. Ensure proper polarity of encoder signal (F3.03).
FEEDBACK LOSS (301)	The tachometer or encoder speed feedback signal was not detected by the drive. This fault is only applicable when the drive is in tachometer or encoder feedback.	<u>G2.15=Tachometer</u> Verify tachometer rating and F2.01 and F2.03 are set properly. Also ensure jumpers J1-J3 are set properly (see F2.04-F2.06). Ensure proper polarity of tachometer signal (G2.11) and invert if necessary (F2.02).
		<u>G2.15=Encoder</u> Verify encoder rating and F3.01 and F3.02 are set properly. Ensure proper polarity of encoder signal (G2.13) and invert if necessary (F3.03).
FIELD LOSS (101)	The motor field current dropped below the level defined by K1.04. (100% field current is defined by T1.03)	Check motor field wiring. Reduce level of K1.04 If field current is not required, disable field output by setting G3.01=Disabled
EXTERNAL FAULT (601)	Parameter K1.14 momentarily became On	When used, a digital input is typically linked to K1.14. Check external wiring on the digital input. Confirm correct logic polarity. If logic is reversed, swap the On and Off values of the digital input.

Fault	Description	Suggested Action
FB CONFIG FAULT (701)	A1.02=Const HP and G2.15=Armature	<p>When the drive is in the constant horsepower mode of operation, either tachometer or encoder feedback is required. Install a motor mounted tachometer or encoder and set G2.15 appropriately.</p> <p>Don't operate the drive in the constant horsepower mode.</p>
OL CONFIG FAULT (702)	A1.02=Const HP and G3.02=Open Loop	<p>When the drive is in the constant horsepower mode of operation, the field loop must be operated in closed loop. Set G3.02=Closed Loop.</p> <p>Don't operate the drive in the constant horsepower mode.</p>
COM PORT C TIMEOUT (603)	No activity was detected on the Com C (RS422/485) Port during the R3.17 time period	<p>Verify proper communications.</p> <p>Increase the R3.17 timeout period.</p> <p>Disable the fault (see R3.18).</p>

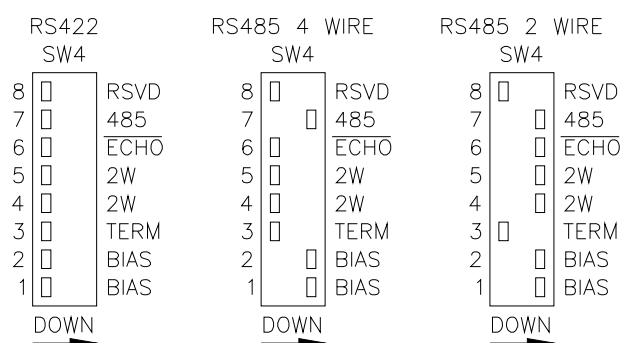
Serial Network Communications

9.1 Physical

The serial interface is a standard feature on all Elite Pro V3 drives. The interface enables other equipment such as a computer, programmable logic controller (PLC), or Human Machine Interface (HMI) to monitor, modify, and/or log data. The network is physically implemented on an RS-422/485 medium (2 or 4 wire selectable) using the Modbus® software protocol. Refer to D14306 on page 149 for network connection information.

RS485 Multidrop Network Wiring

All network wiring should use the TB2 terminal strip located on the right-hand side of the unit. DIP switch SW4 should be set as follows:



Fail-Safe Biasing

Failsafe biasing is required to bias the communication lines to a known state when no devices are communicating (i.e., driving the bus). Fail-safe biasing should be active in **ONLY** one unit in the network. Placing positions 1 & 2 in the closed (down) position activates the Fail-Safe biasing. In some cases, the network master may provide this biasing, and therefore would not need to be activated on one of the slave units. (Refer to master documentation.)

Terminator

Terminating resistors are required at each end of a daisy chained RS-485 network in order to provide clean, error free signal transmissions. If the Elite Pro is at one end of the daisy chained network, activate the terminating resistor by placing position 3 in the closed position (down).

2-Wire

RS-485 networks can operate in either a 2-Wire or 4-Wire configuration. In 4-Wire mode, the transmit and receive signals use separate twisted wire pairs. In 2-Wire mode, the transmit and receive signals share the same twisted wire pair. If a 2-Wire network is used, place positions 4 & 5 in the closed (down) position. This provides an internal connection from TXD+ to RXD+ and from TXD- to RXD-, and eliminates the need to add jumpers externally to the drive between these points.

9.2 Modbus® Protocol

The Elite Pro V3 supports a subset of the Modbus® RTU communications protocol. This section describes the Elite Pro's implementation of the protocol. For a complete detailed specification of the entire Modbus® protocol, please refer to <http://www.modbus.org>.

In the Elite Pro, functions 1,2,3,4,5,6,8,15, & 16 are supported. The message format or

frame varies depending upon which function code is used. Each frame is started by the slave address and ends with a CRC-16 error checking code. If the slave addresses do not match or the CRC-16 code is invalid, the slave ignores the message and no response is returned. The Elite Pro acts as a slave (server) to a single master (client). Bus contentions are avoided since the Modbus master initiates all communications. Slave devices only place data on the bus in response to a master's request. Each slave device on the bus must have a unique network address.

Frames consist of 8 bit data bytes. Parity can set for None, Odd, or Even. Frames are separated on the bus by a silent period in which no data transmissions occur. This silent period thus signals devices on the bus when a frame has ended and can now begin to examine the frame data. Bytes within a frame must therefore be sent in a continuous stream to avoid silent periods.

The Modbus® protocol uses two general types of data: bits and registers. Registers are composed of 16 bits. Some slave devices further divide each of these data types depending upon its method of access (read-write or read-only). The Elite Pro makes no distinction between read-write and read-only with respect to the command. For example, any register can be read by using Function Code 3 or 4, and any bit can be read using Function Codes 1 or 2. Attempts to write a value to a read-only parameter are ignored.

Since all of the Elite Pro's parameters are implemented internally as 16 bit registers, each parameter can be accessed by using a bit or a register command. Thus, a register can be read or written to by a bit command. In these cases, any non-zero value is interpreted as True (1) and zero is interpreted as False (0).

In the following, hexadecimal number are represented with an 'h' suffix and binary numbers with a 'b' suffix. Decimal data is shown with no suffix.

Code	Function	Data Type	Access	Data Type Code
1 (01h)	Read Bits	bit	(read-write)	0x
2 (02h)	Read Bits	bit	(read-only)	1x
3 (03h)	Read Multiple Registers	16 bit register	(read-write)	4x
4 (04h)	Read Multiple Registers	16 bit register	(read-only)	3x
5 (05h)	Write Single Bit	bit	(read-write)	0x
6 (06h)	Write Single Register	16 bit register	(read-write)	4x
8 (08h)	Diagnostics (Loopback)	-	-	-
15 (0Fh)	Write Multiple Bits	bit	(read-write)	0x
16 (10h)	Write Multiple Registers	16 bit register	(read-write)	4x

Table 19: Supported Modbus® Functions

10.1 Printed Circuit Assemblies

Processor Board

All models..... C14045-000

Field IFB Board

All models..... C14158-000

Trigger Board

Models EP2xxx-000 D14163-000

Models EP4xxx-000 D14163-001

CT ID Board

Models EPx020-000..... C14166-000

Models EPx040-000..... C14166-001

Models EPx060-000..... C14166-002

Models EPx075-000..... C14166-003

Models EPx100-000..... C14166-004

Models EPx125-000..... C14166-005

Models EPx150-000..... C14166-006

Models EPx200-000..... C14166-007

Models EPx250-000..... C14166-008

Models EPx300-000..... C14166-009

Models EPx400-000..... C14166-010

Models EPx500-000..... C14166-011

Models EPx600-000..... C14166-012

Models EPx700-000..... C14166-013

Control Board

All models..... D14171-000

Regulator Board

All models..... D14177-000

Snubber Board

All models..... C14188-000

10.2 Fuses

Terminal Block Field Fuses: Fast Acting, 600VAC

Model	Amps	Carotron P/N	Manufacturer P/N
EPx020-000 thru EPx060-000	10	FUS1004-04	Bussmann KTK-10 Littelfuse KLK-10
EPx075-000 thru EPx700-000	15	FUS1004-00	Bussmann KTK-15 Littelfuse KLK-15

Table 20: Field Fuses

Recommended Line Fuses: Semiconductor (Very Fast Acting), 500VAC
(Not included with basic drive package)

Model	Amps	Carotron P/N	Manufacturer P/N
EPx020-000	50	FUS1009-00	Bussmann FWH50 Littelfuse L50S50
EPx040-000	100	FUS1009-01	Bussmann FWH100 Littelfuse L50S100
EPx060-000	150	FUS1009-02	Bussmann FWH150 Littelfuse L50S150
EPx075-000	175	FUS1009-03	Bussmann FWH175 Littelfuse L50S175
EPx100-000	250	FUS1009-05	Bussmann FWH250 Littelfuse L50S250
EPx125-000	300	FUS1009-06	Bussmann FWH300 Littelfuse L50S300
EPx150-000	350	FUS1009-04	Bussmann FWH350 Littelfuse L50S350
EPx200-000	450	FUS1009-07	Bussmann FWH450 Littelfuse L50S450
EPx250-000	600	FUS1009-08	Bussmann FWH600 Littelfuse L50S600
EPx300-000	700	FUS1009-09	Bussmann FWH700 Littelfuse L50S700
EPx400-000	1000	FUS1009-12	Bussmann FWH1000
EPx500-000	1200	FUS1009-13	Bussmann FWH1200
EPx600-000	1400	FUS1009-14	Bussmann FWH1400
EPx700-000	1600	FUS1009-15	Bussmann FWH1600

Table 21: Recommended Line Fuses

10.3 Power Components

Armature Bridge

All armature bridge devices are dual SCR isolated power modules rated at 1400 volts (minimum) repetitive peak off state and reverse voltage and have 1000V/uS dvdt. There are 3 each on EP2 Series models, PMD3-5, and 3 additional, PMD6-8, on EP4 Series models. Current ratings are per control model.

NOTE: The IR (Internaltional Rectifier) modules are not pin-for-pin compatible with the Eupec and Semikron modules. The gate and cathode signal leads on IR modules are reversed on the second SCR device. Consult factory for assistance when replacing a Eupec or Semikron module with an IR module or vice-versa.

Model	Amps	Carotron P/N	Manufacturer P/N
EPx020-000	31	PMD1025-00	Eupec TT31N14KOF Semikron SKKT42/14E IR IRKT41/14A
EPx040-000	56	PMD1026-00	Eupec TT56N14KOF Semikron SKKT57/14E IR IRKT56/14A
EPx060-000	92	PMD1027-00	Eupec TT92N14KOF Semikron SKKT92/14E IR IRKT91/14A
EPx075-000	105	PMD1019-00	Eupec TT105N14KOF Semikron SKKT106/14E IR IRKT105/14A
EPx100-000	131	PMD1029-00	Eupec TT131N14KOF IR IRKT136/14
EPx125-000 EPx150-000	162	PMD1021-00	Eupec TT162N14KOF IR IRKT162/14
EPx200-000 EPx250-000 EPx300-000	251	PMD1031-00	Eupec TT251N14KOF IR IRKT250/14
EPx400-000	500	PMD1033-00	Powerex LD431650
EPx500-000 EPx600-000 EPx700-000	700	PMD1034-00	Powerex PD431607

Table 22: Armature Bridge Modules

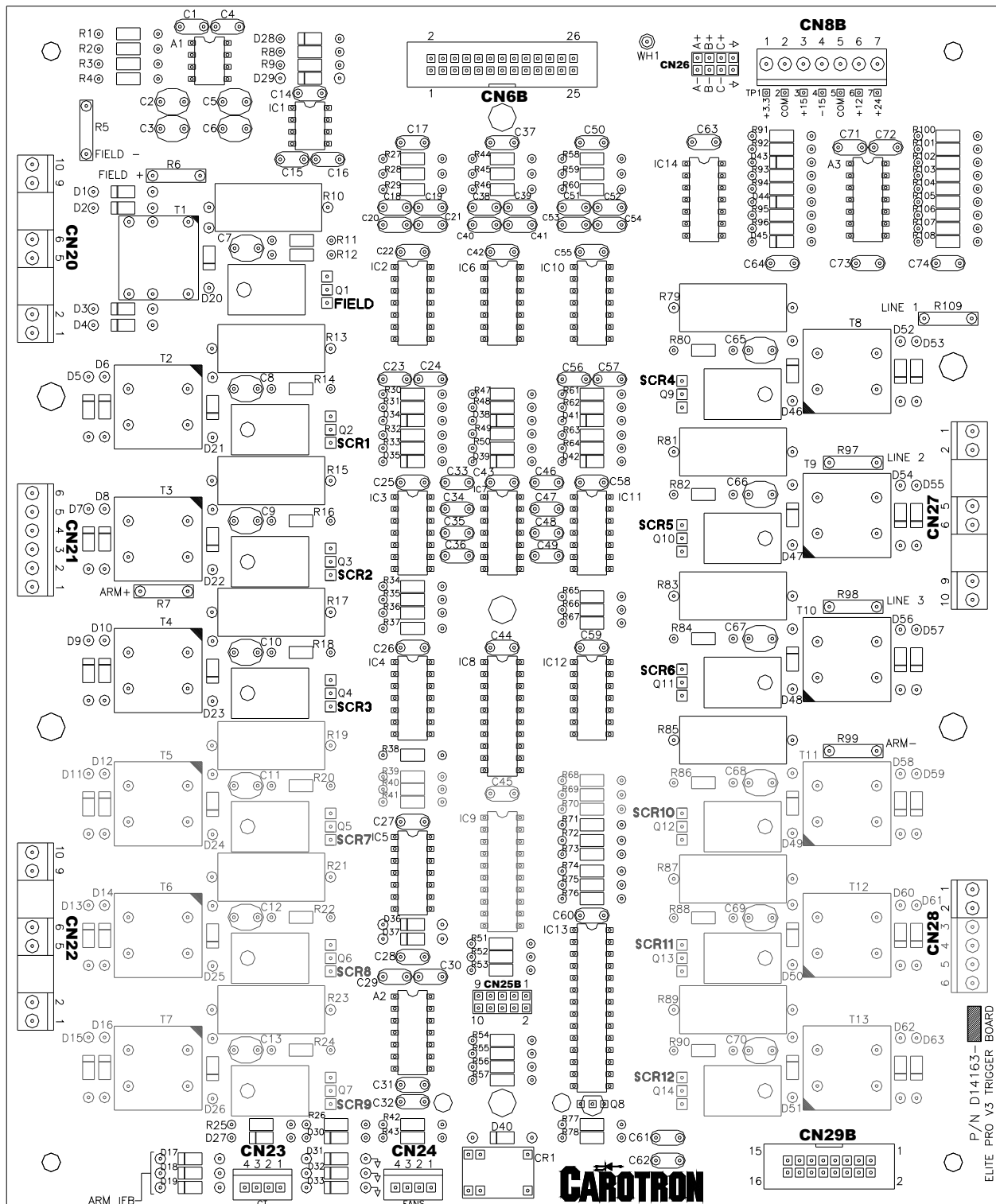
Field Supply

The Field Supply uses one dual SCR isolated power module (PMD1) rated at 1400 volts (minimum), and one dual diode module (PMD2) also rated at 1400 volts (minimum).

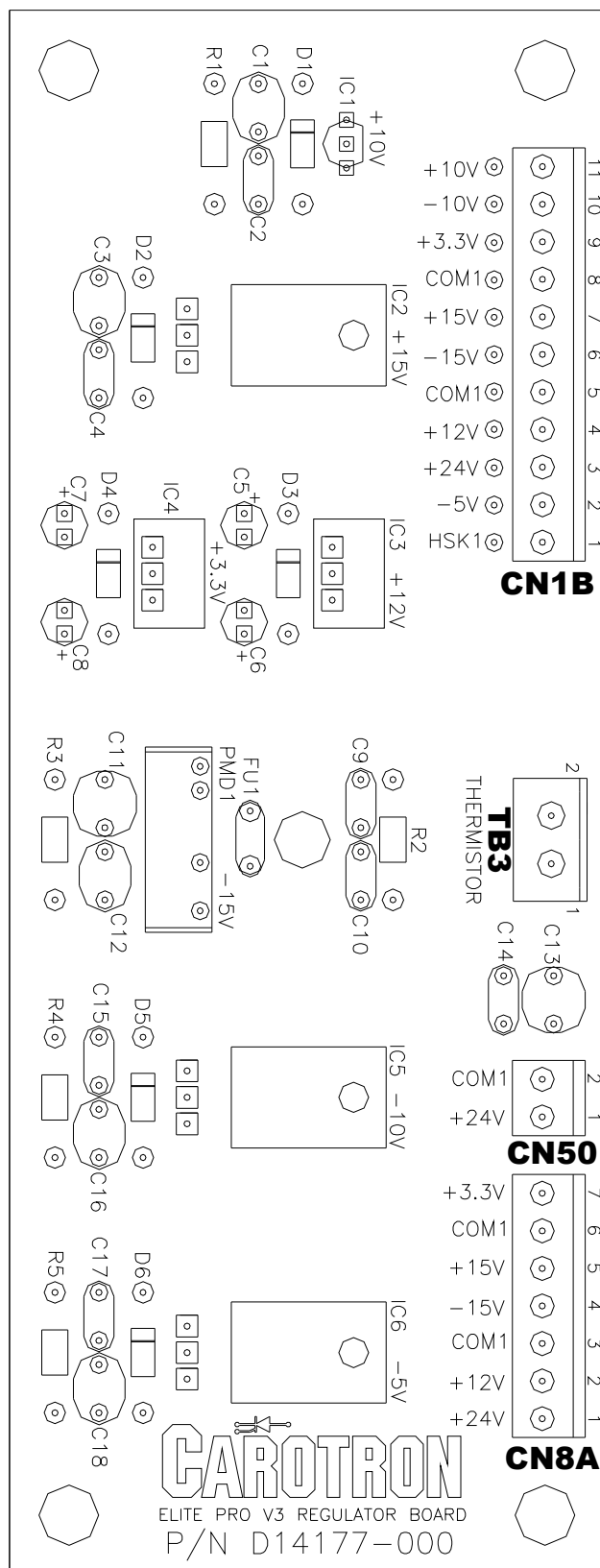
Model	Module	Amps	Carotron P/N	Manufacturer P/N
All Models	PMD1	31	PMD1025-00	Eupec TT31N14KOF Semikron SKKT42/14E
All Models	PMD2	31	PMD1028-00	Eupec DD31N14K Semikron SKKD26/14

Table 23: Field Supply Modules

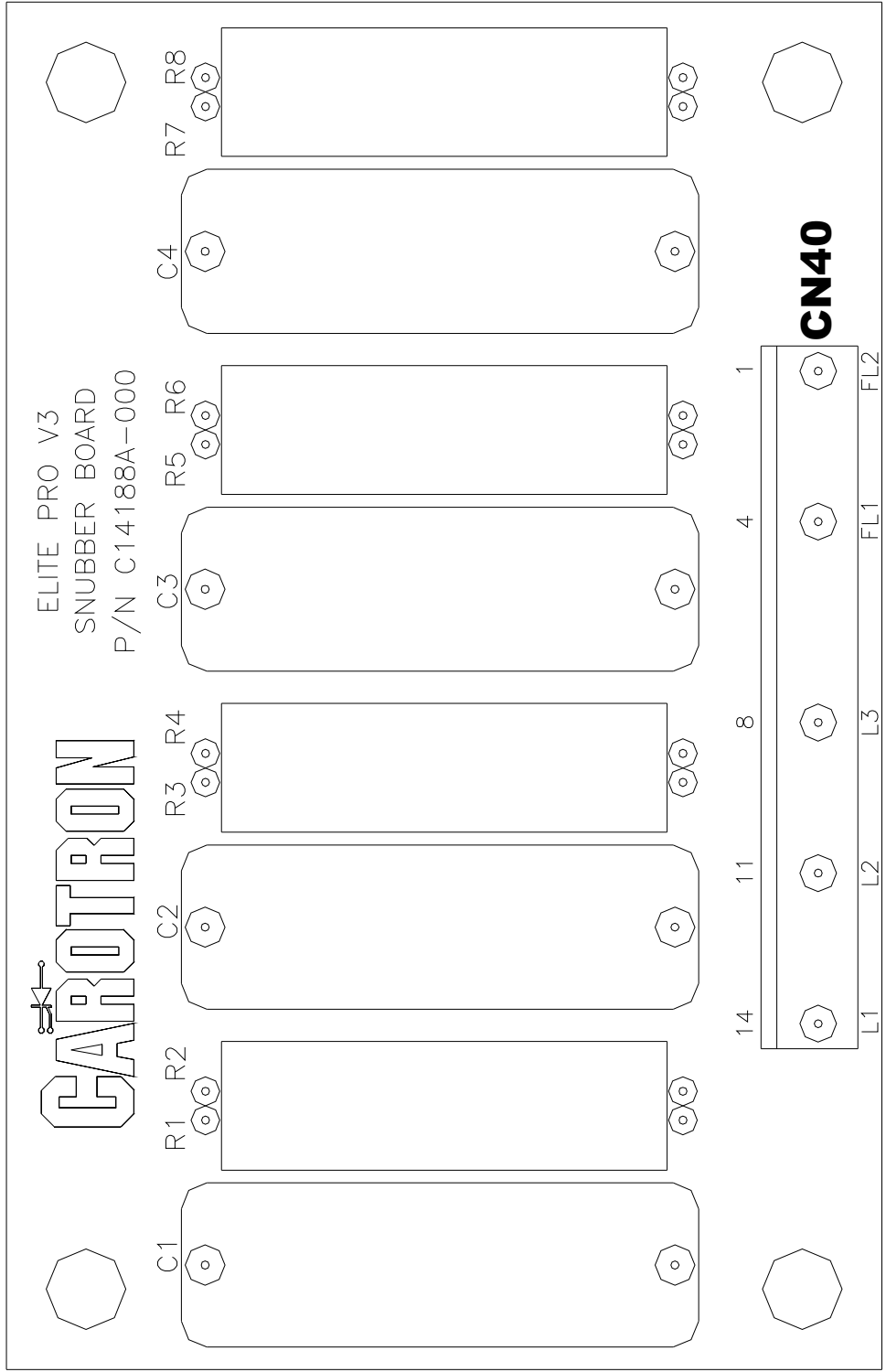




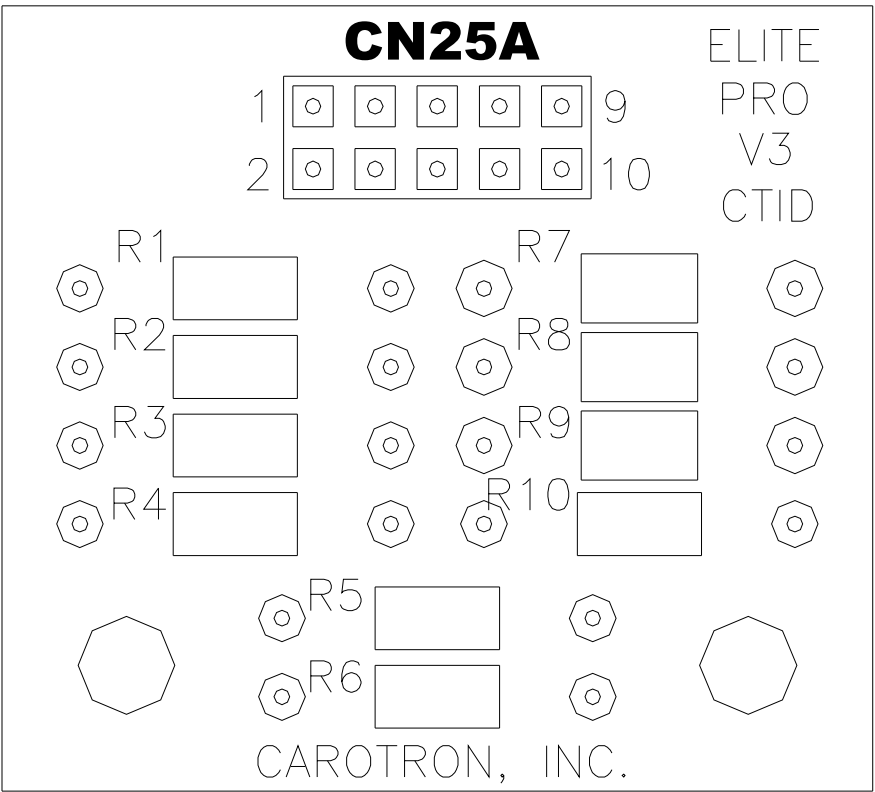
D14163 TRIGGER BOARD ASSEMBLY



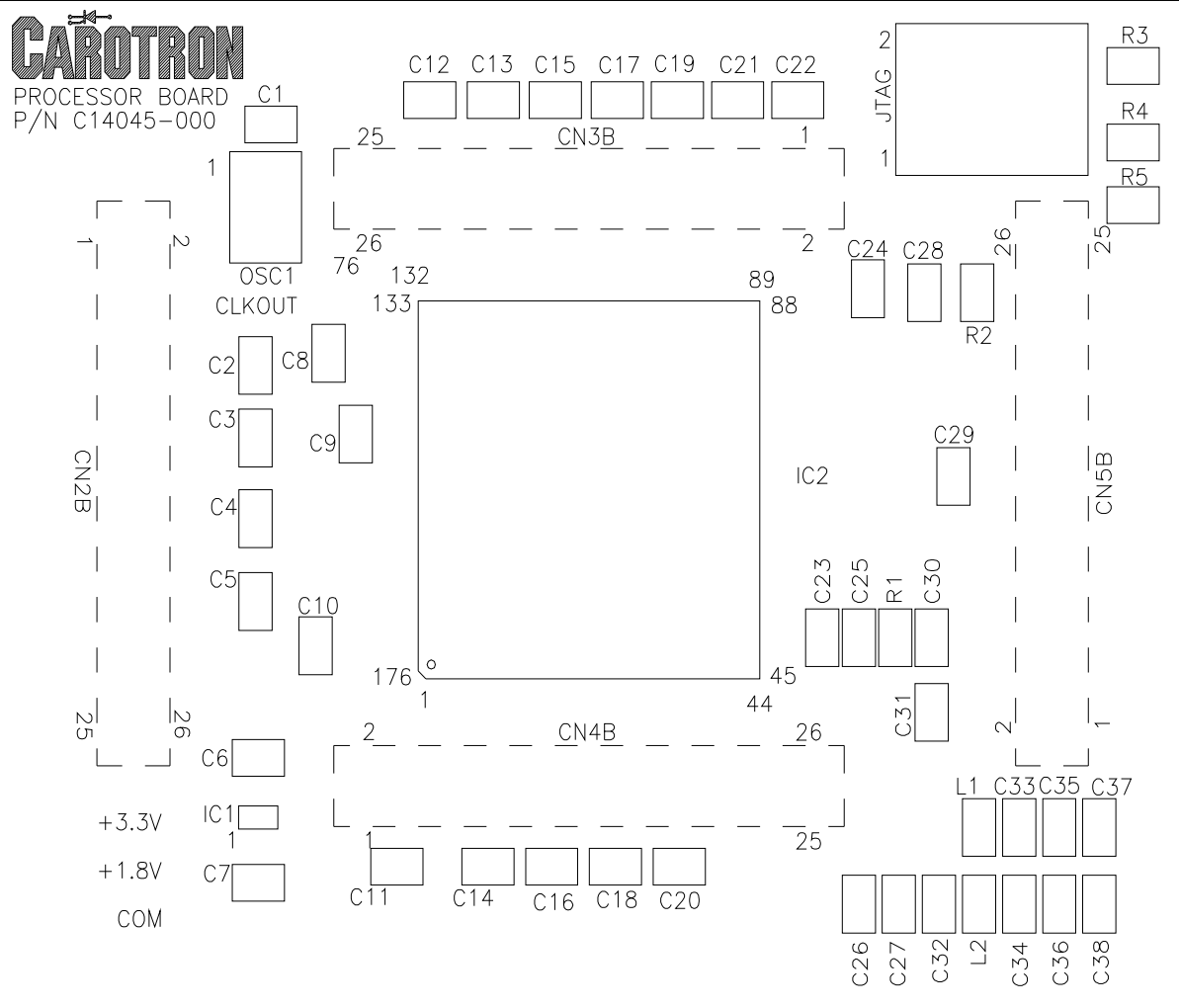
D14177 REGULATOR BOARD ASSEMBLY



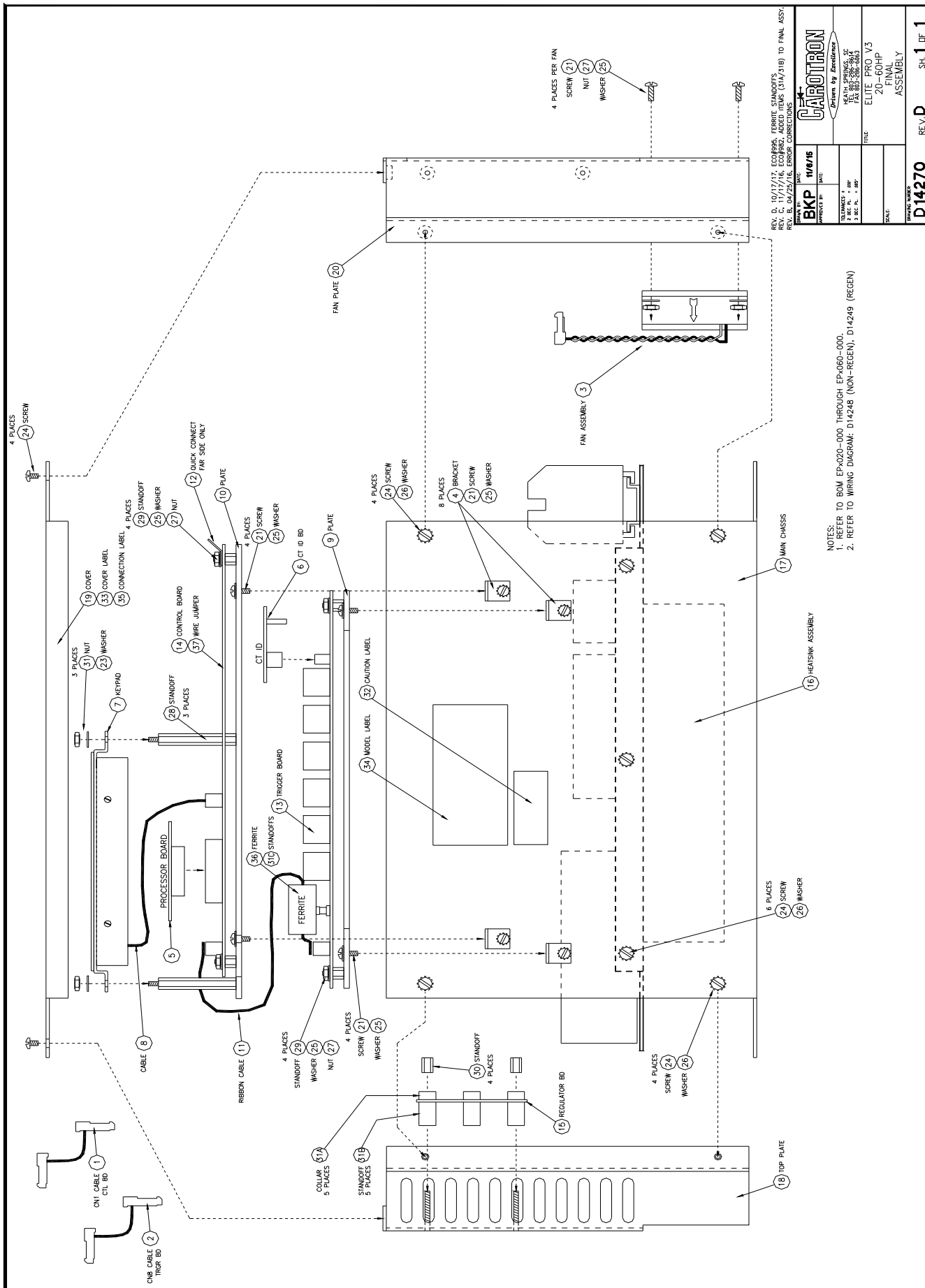
C14188 SNUBBER BOARD ASSEMBLY

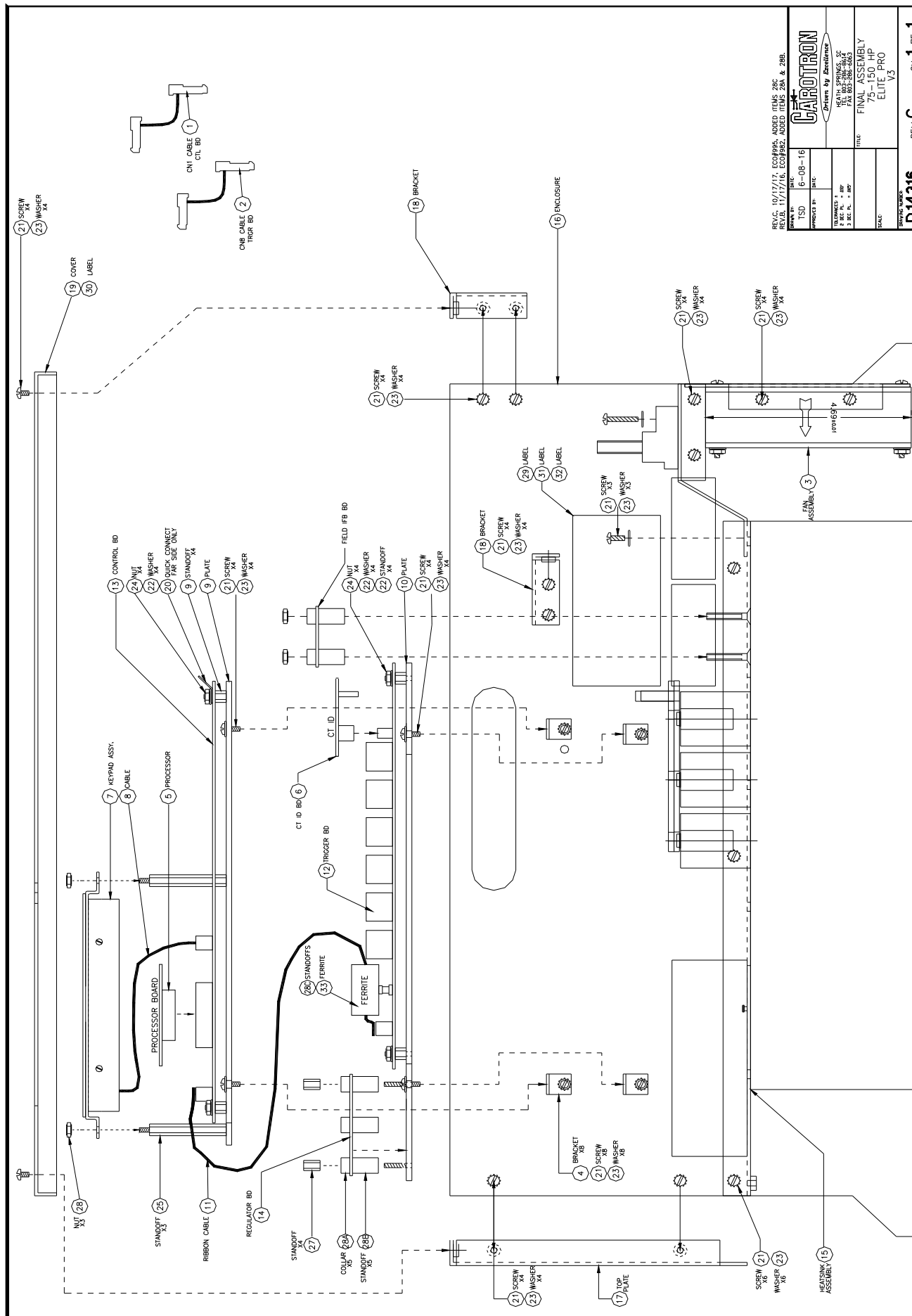


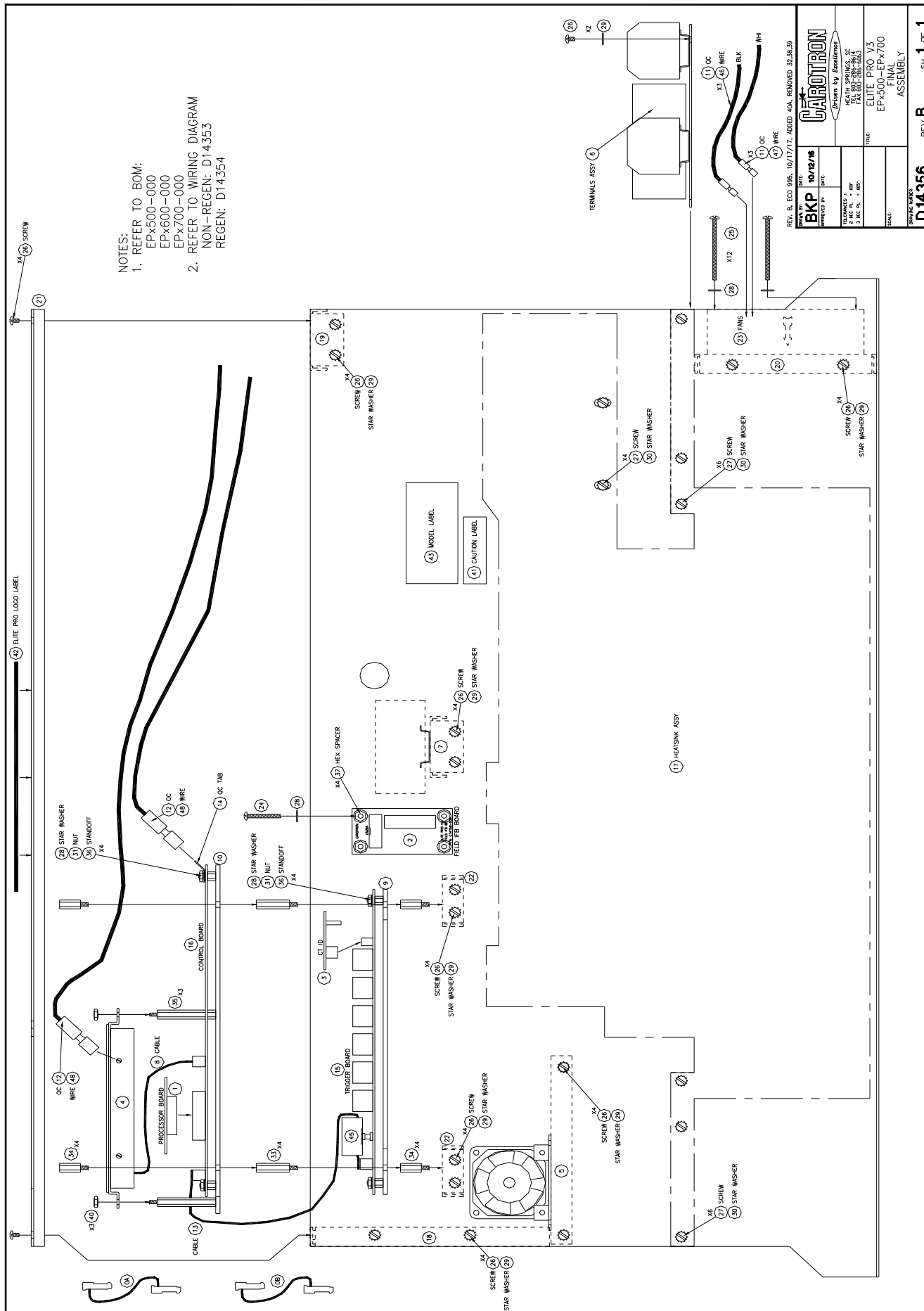
C14166 CT ID BOARD ASSEMBLY

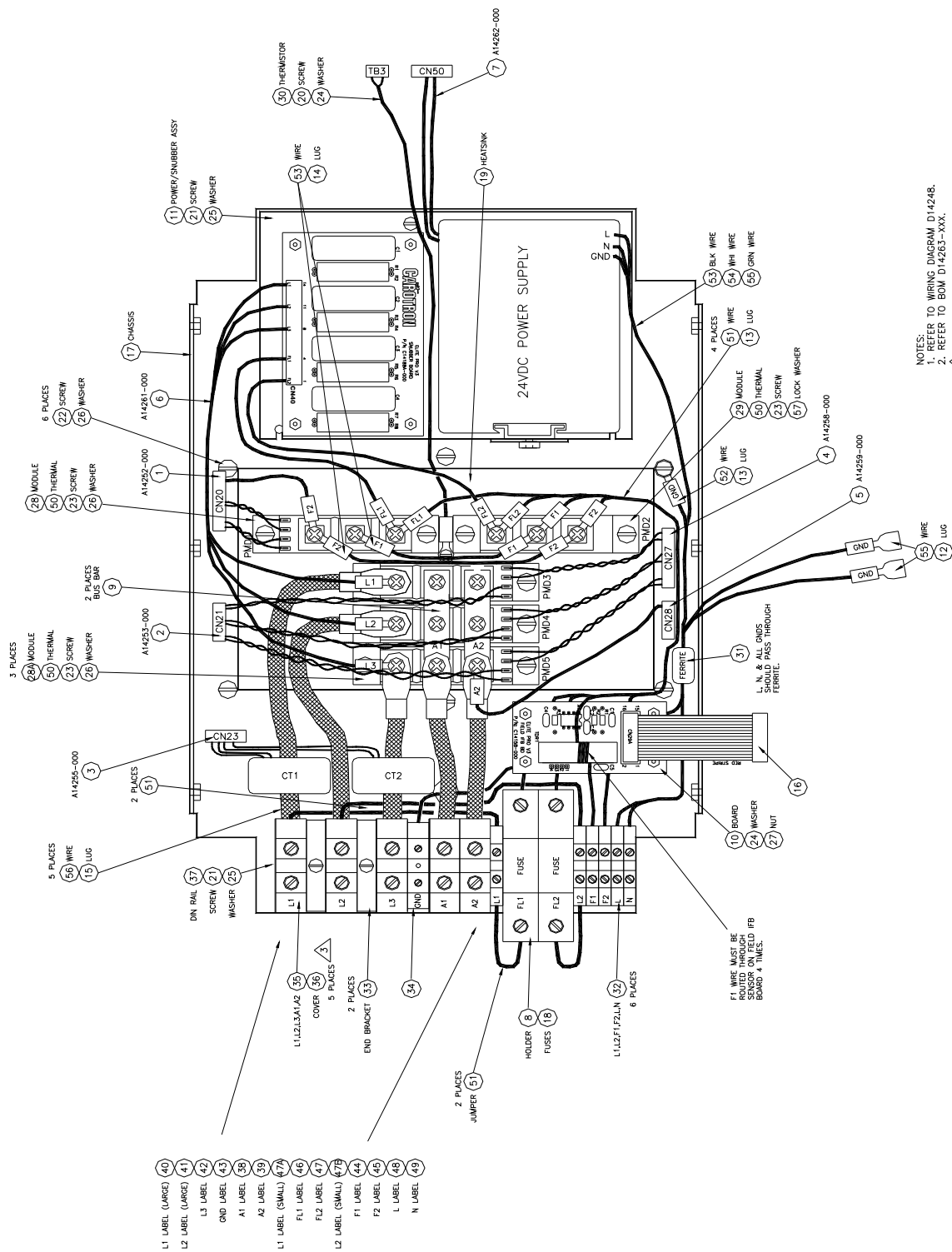


C14145 PROCESSOR BOARD ASSEMBLY

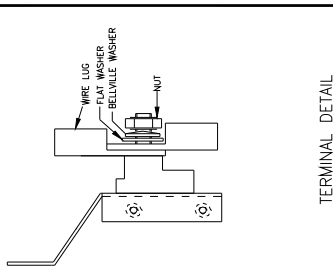









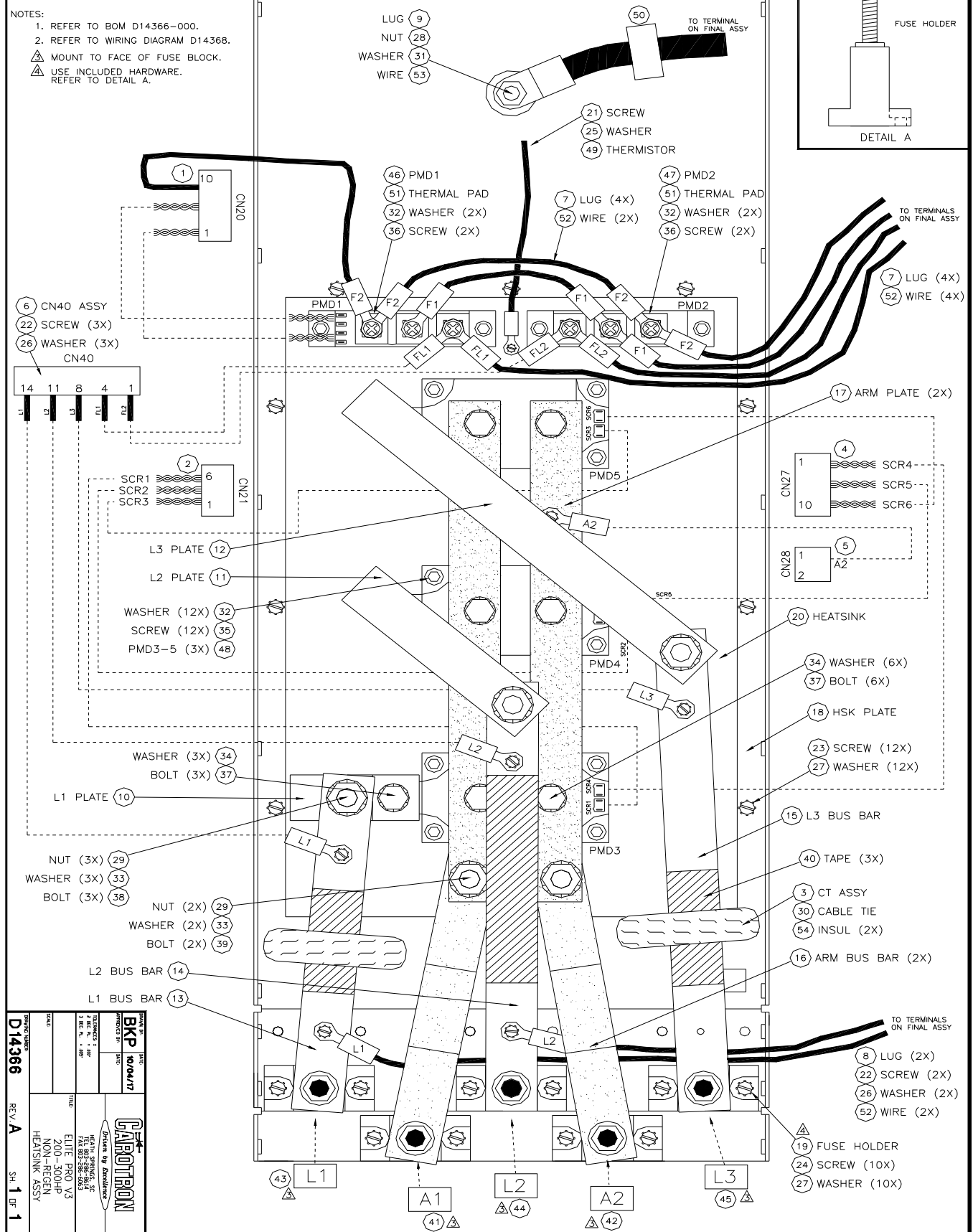
REV. C. 09/14/16, POWER MODULE HARDWARE CHANGE, ECO#976
REV. B. 04/25/16, ERROR CORRECTIONS



DATE	10/12/78	 <p><i>Driven by Excellence</i></p> <p>HEATH SPRINGS, SC TEL 803-586-7641 FAX 803-586-7641</p>
TSD		
APPROVED BY		
DATE		
DELIVERANCES + 1 HP 3 SEC P. + 100"		HEATSEAL ASSEMBLY MODELS EP4075-000 -- EP4150-000
SCALE		FILE
DRAWING NUMBER		REV A
D14318		SH 1 OF 1

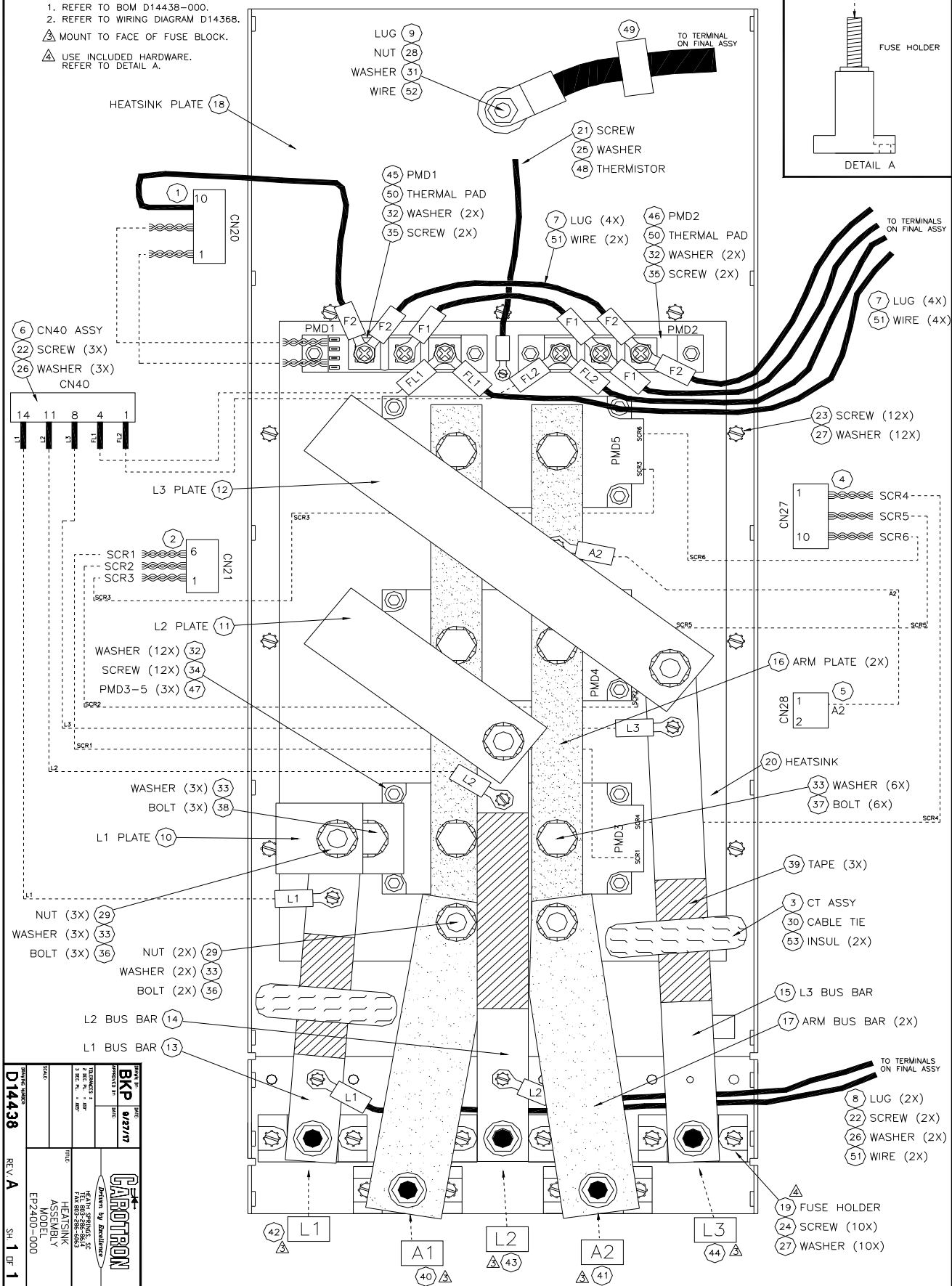
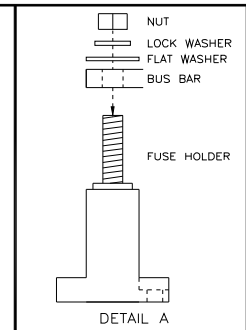
NOTES:

1. REFER TO BOM D14366-000.
2. REFER TO WIRING DIAGRAM D14368.
- △ MOUNT TO FACE OF FUSE BLOCK.
- △ USE INCLUDED HARDWARE. REFER TO DETAIL A.

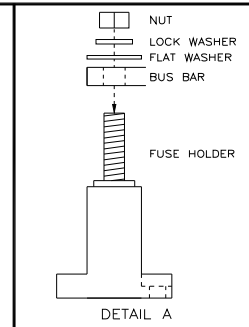


D14366	REV A	SH 1 OF 1	CAROTRON	ELITE PRO V3 200-300HP NON-REGEN HEATSINK ASSY

1. REFER TO BOM D14438-000.
2. REFER TO WIRING DIAGRAM D14368.
3. MOUNT TO FACE OF FUSE BLOCK.
4. USE INCLUDED HARDWARE.
REFER TO DETAIL A.

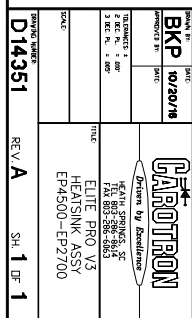


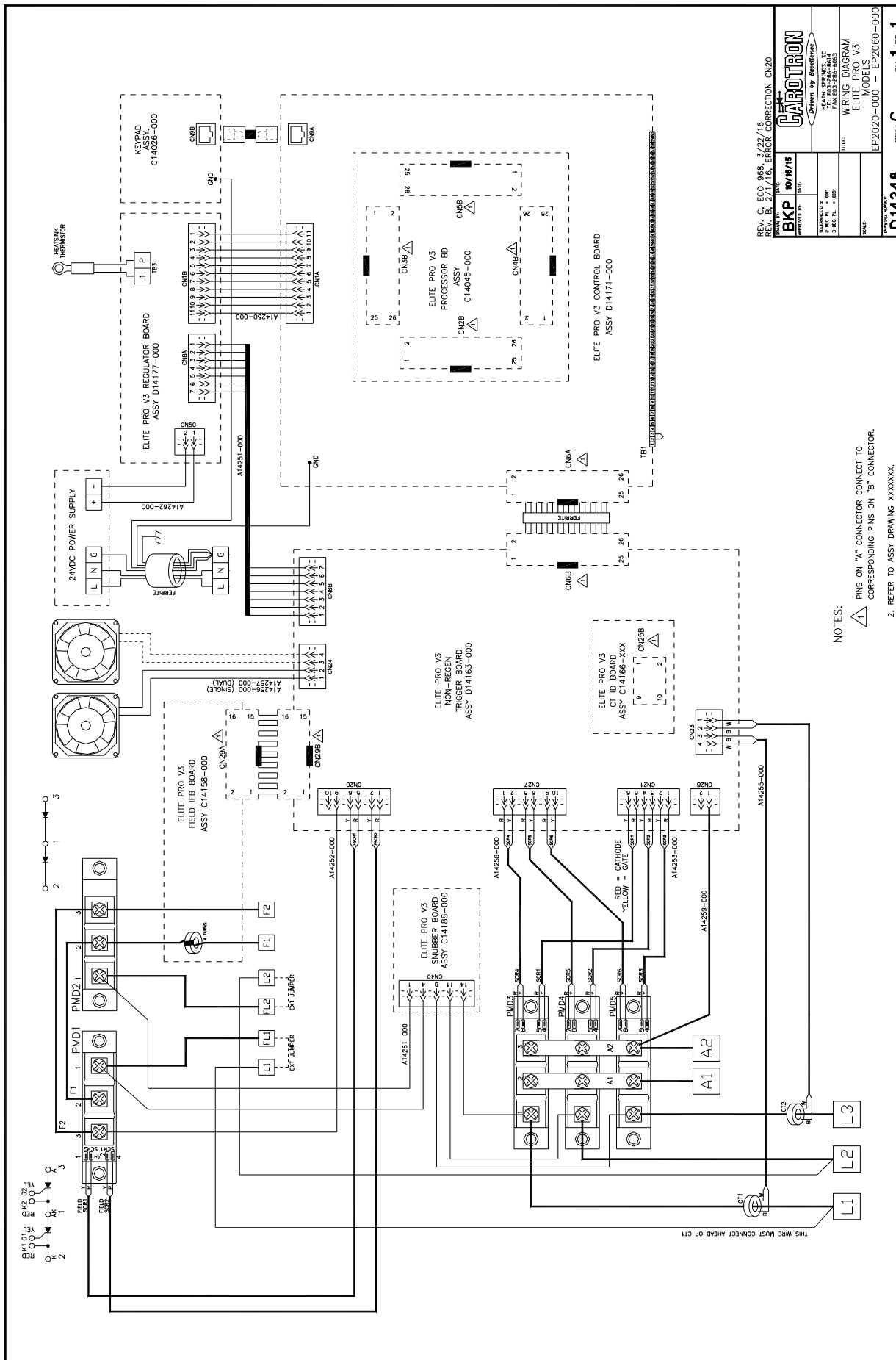
1. REFER TO BOM D14439-000.
2. REFER TO WIRING DIAGRAM D14369.
3. MOUNT TO FACE OF FUSE BLOCK.
4. USE INCLUDED HARDWARE.
REFER TO DETAIL A.

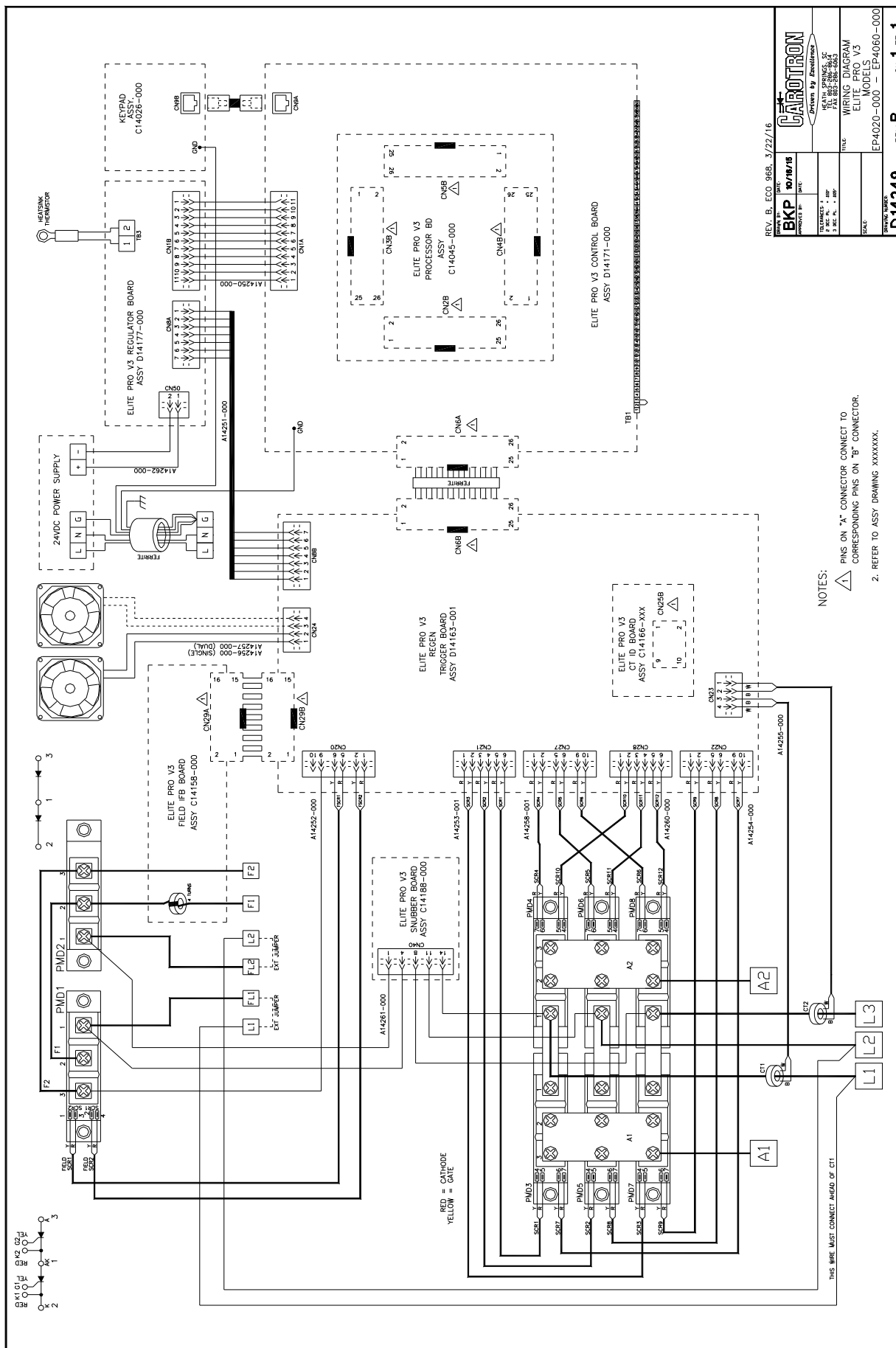


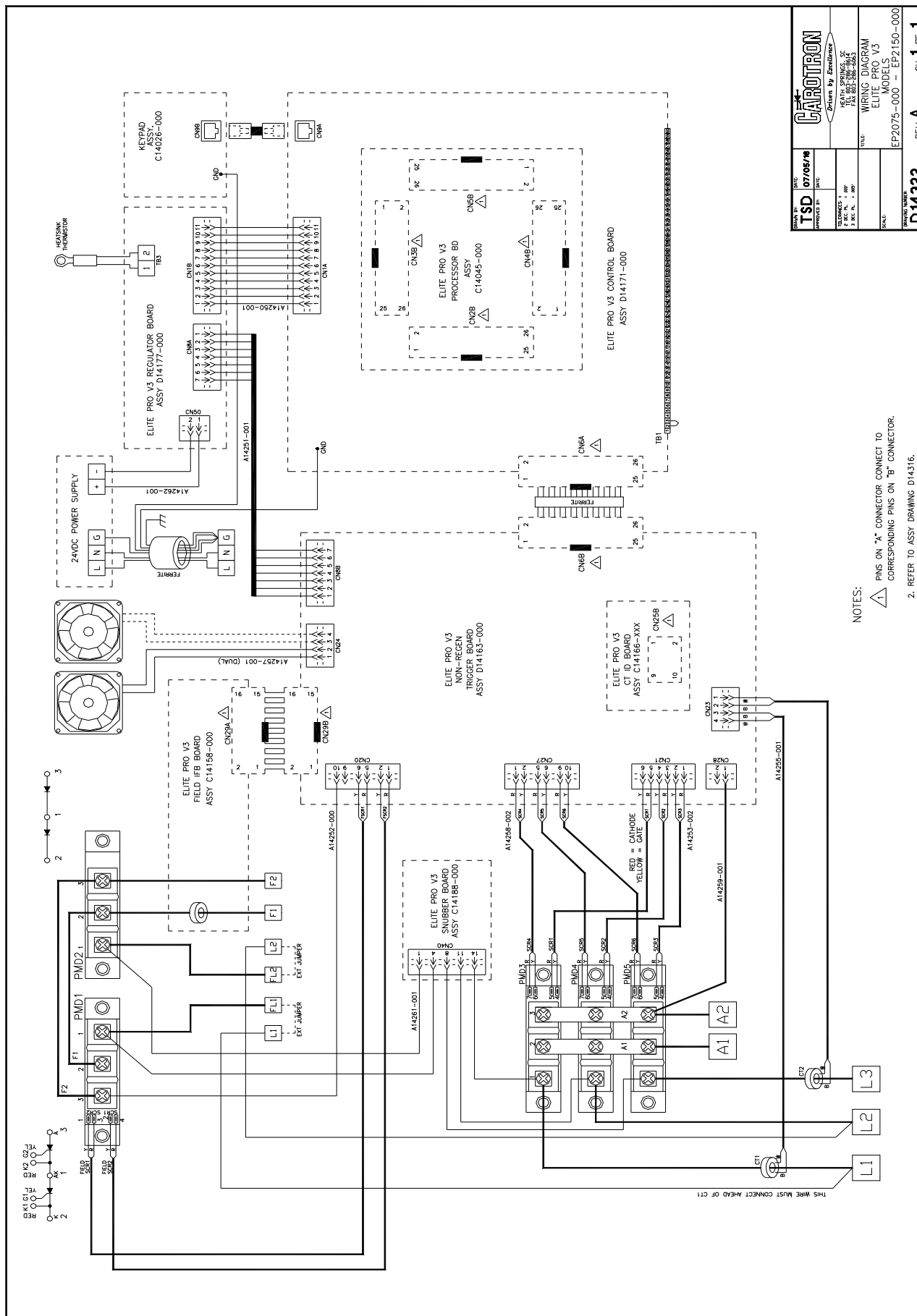
1. IF USING COPPER BUS BARS:

-
- LIFTING PLATE DETAIL
(PLATE SHOWN VERTICAL)

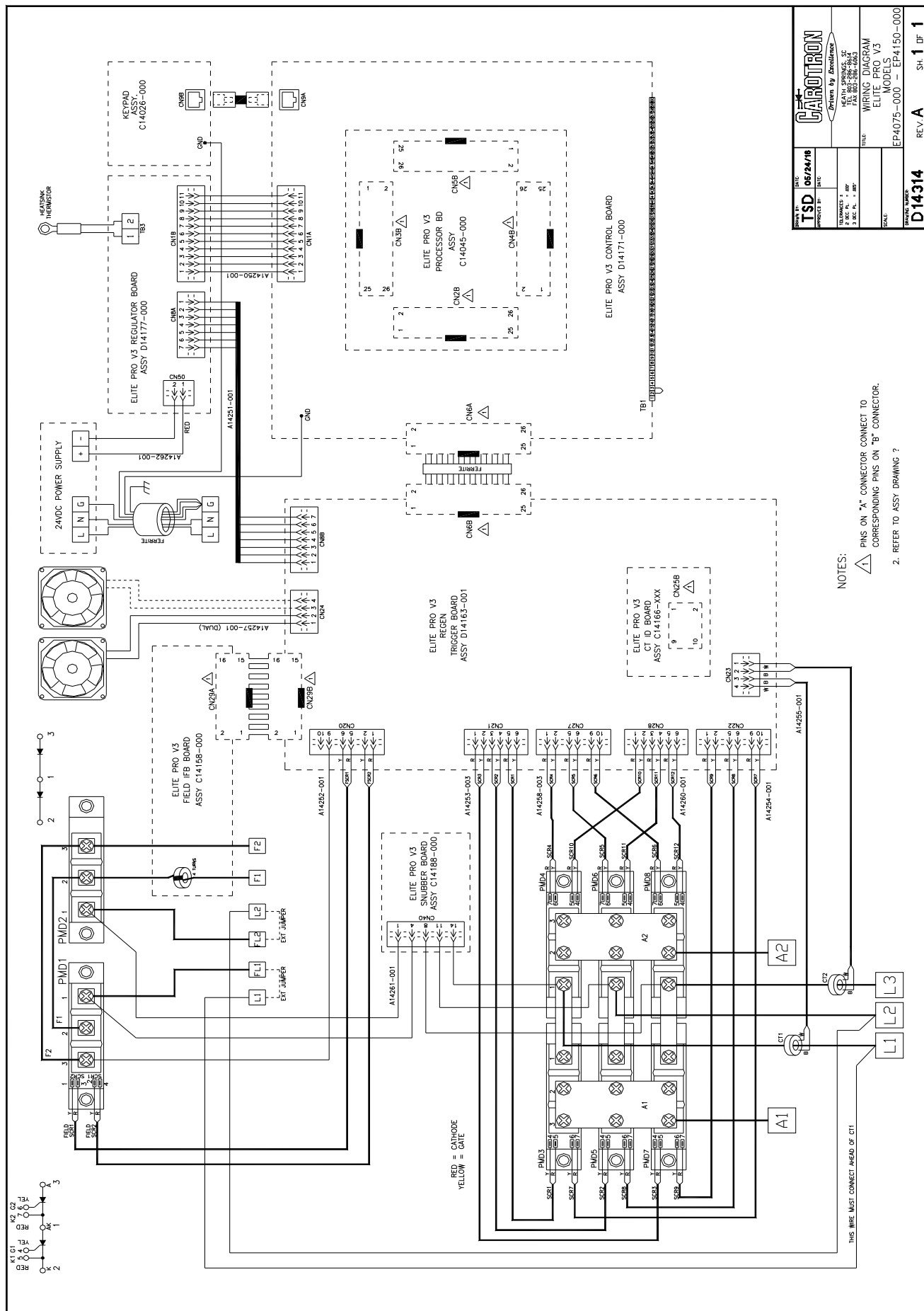




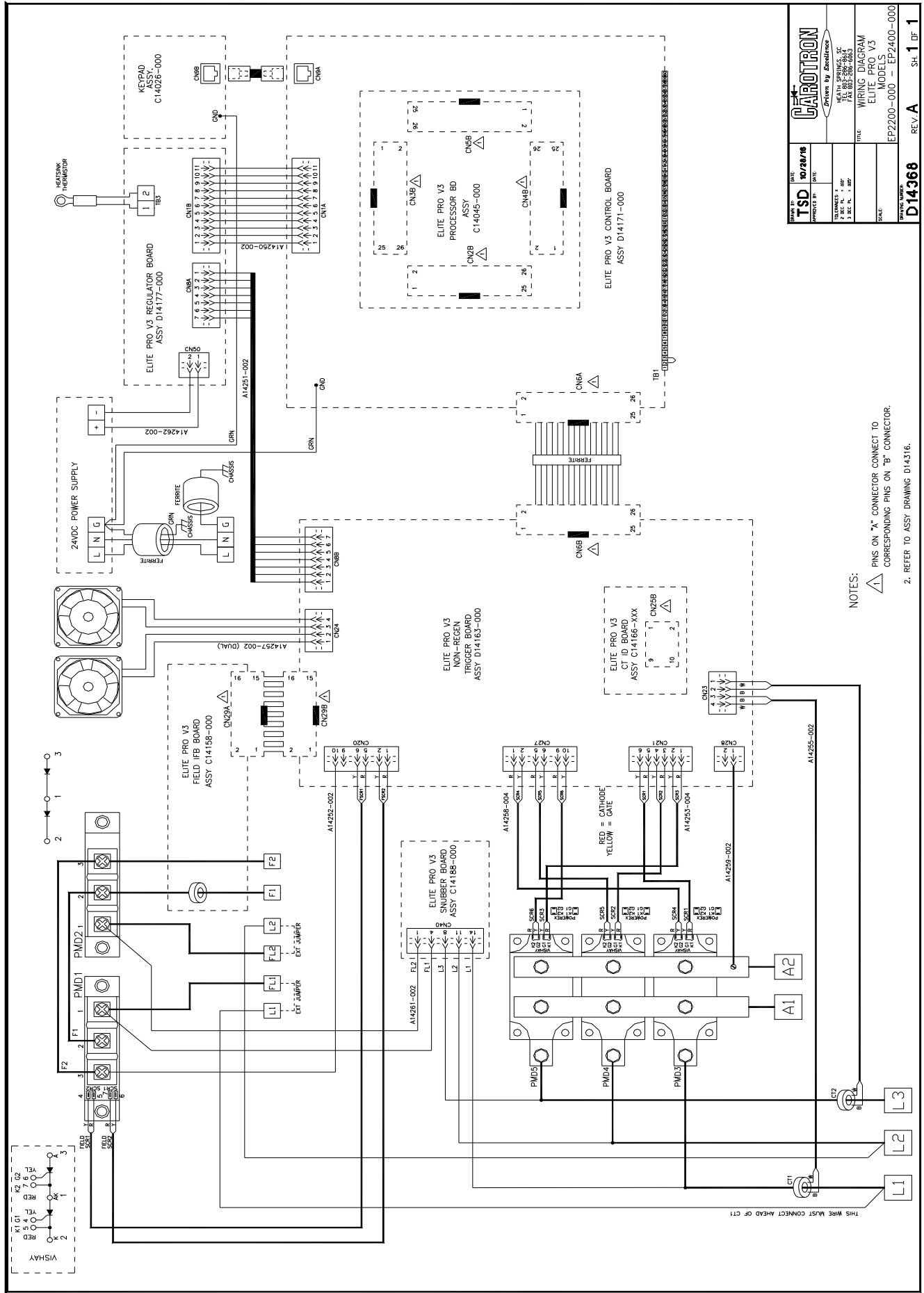


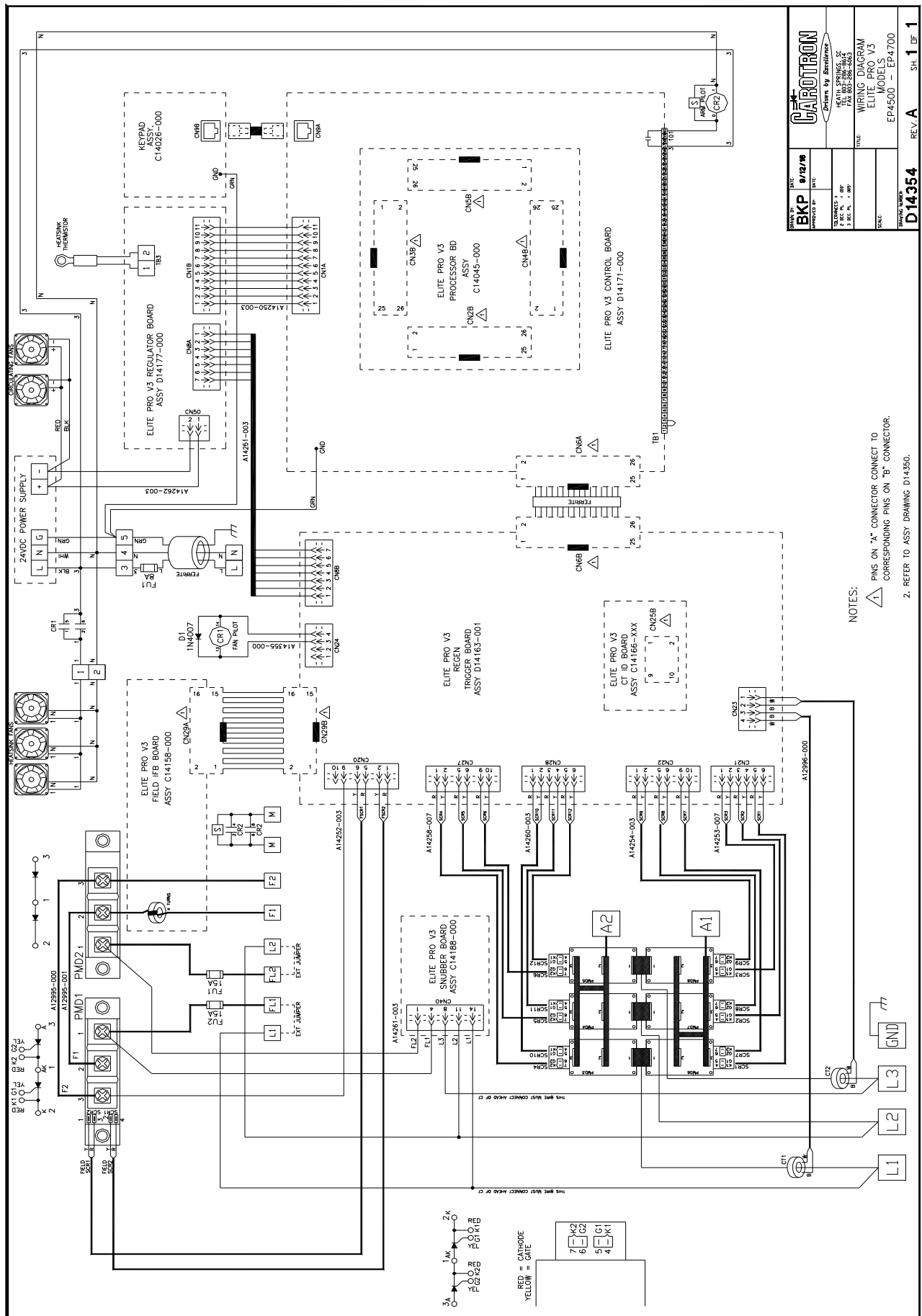


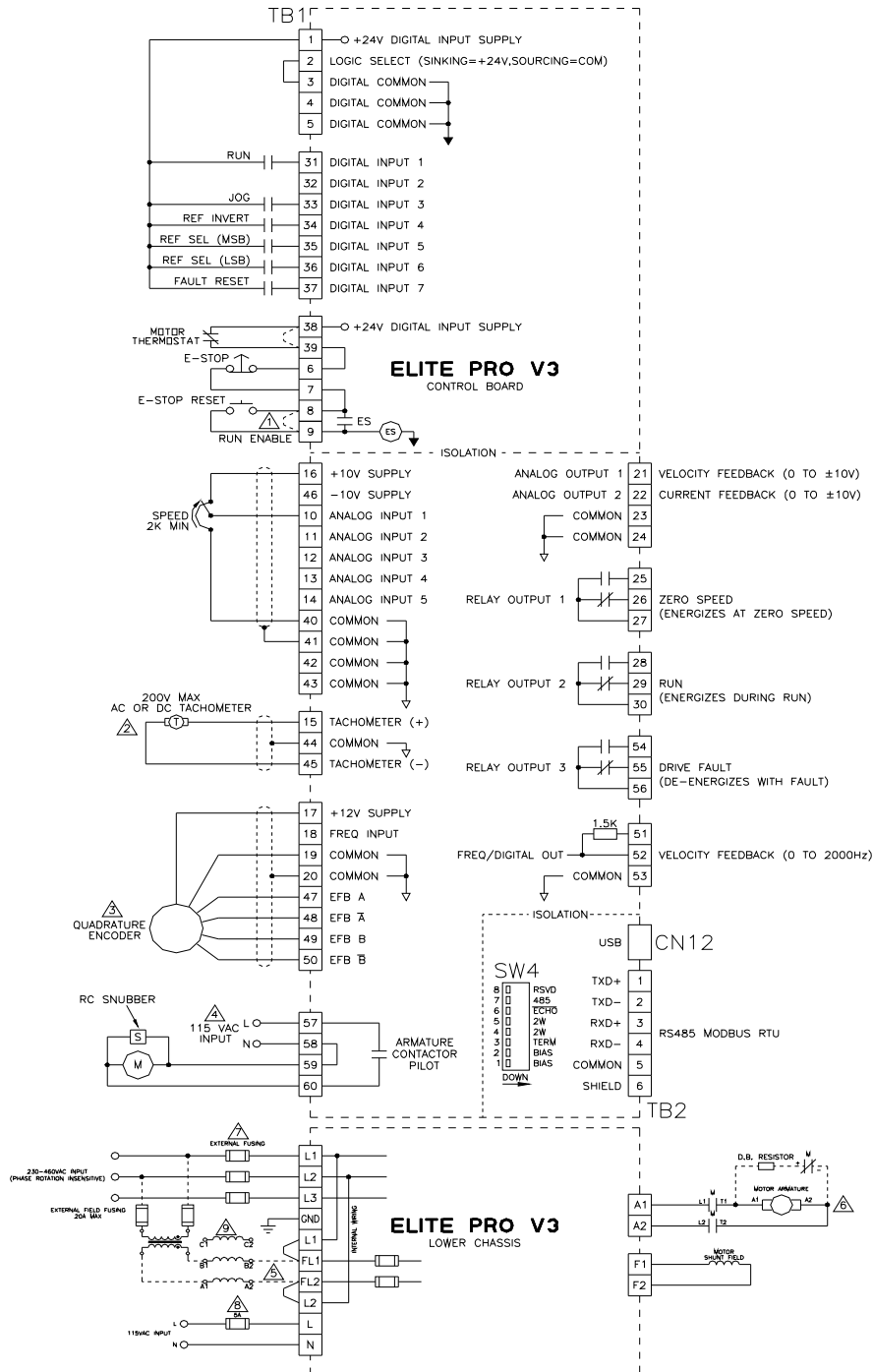
DATE: 07/05/78	DATE:
DESIGNED BY: TSD	DESIGNED BY:
APPROVED BY: TSD	APPROVED BY:
REVISION: 1	REVISION: 1
DATE: 1/80	DATE: 1/80
SCALE: 1/80	SCALE: 1/80
WIRING NUMBER: D14322	WIRING NUMBER: D14322
REV: A	REV: A
SH: 1	SH: 1
DF: 1	DF: 1



DATE	06/24/16	TS	06/24/16
APPROVED BY		DATE	
DESIGNED BY		DATE	
CHECKED BY		DATE	
SCALE		DATE	
REV. A	SH. 1	DF. 1	







- NOTES:
- ⚠ JUMPER CAN BE SUBSTITUTED FOR ESTOP RESET IF MAINTAINED ESTOP IS USED.
 - ⚠ OPTIONAL TACHOMETER FEEDBACK CONNECTIONS SHOWN.
 - ⚠ OPTIONAL QUADRATURE ENCODER FEEDBACK CONNECTIONS SHOWN.
 - ⚠ 115 VAC SHOWN FOR ARMATURE CONTACTOR COIL. ACTUAL VOLTAGE REQUIRED DEPENDENT UPON ARMATURE CONTACTOR USED.
 - ⚠ IF USED, MUST FOLLOW PHASING OF L1 AND L2. REMOVE FACTORY JUMPERS.
 - ⚠ OPTIONAL DYNAMIC BRAKING CONNECTIONS SHOWN.
 - ⚠ REFER TO SPARE PARTS SECTION IN MANUAL FOR RECOMMENDED FUSE SIZING ACCORDING TO DRIVE MODEL.
 - ⚠ EXTERNAL FUSING NOT REQUIRED ON EPx500-EPx700 MODELS. INTERNAL FUSING IS PROVIDED.
 - ⚠ OPTIONAL LINE REACTOR CONNECTIONS SHOWN.

REV. C, 9/26/19, ADDED FIELD LINE REACTOR OPTION

BKP **ca/rw**

CAIPROTON

DESIGNED BY: **CAIPROTON**

TELEPHONE: 1-800-368-5843

FAX: 800-368-5843

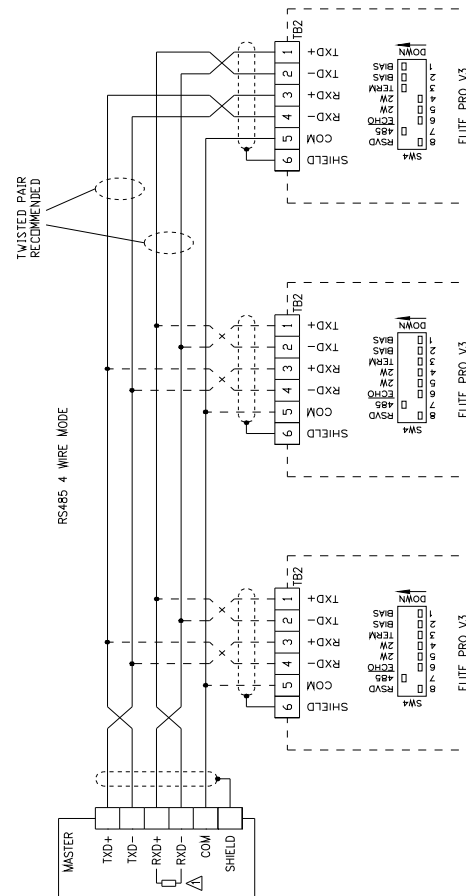
EMAIL: info@caiproton.com

WEBSITE: www.caiproton.com

TITLE: **ELITE PRO V3 GENERAL CONNECTIONS**

SCALE: **1 OF 1**

D14308 **REV. C** **SH 1 OF 1**

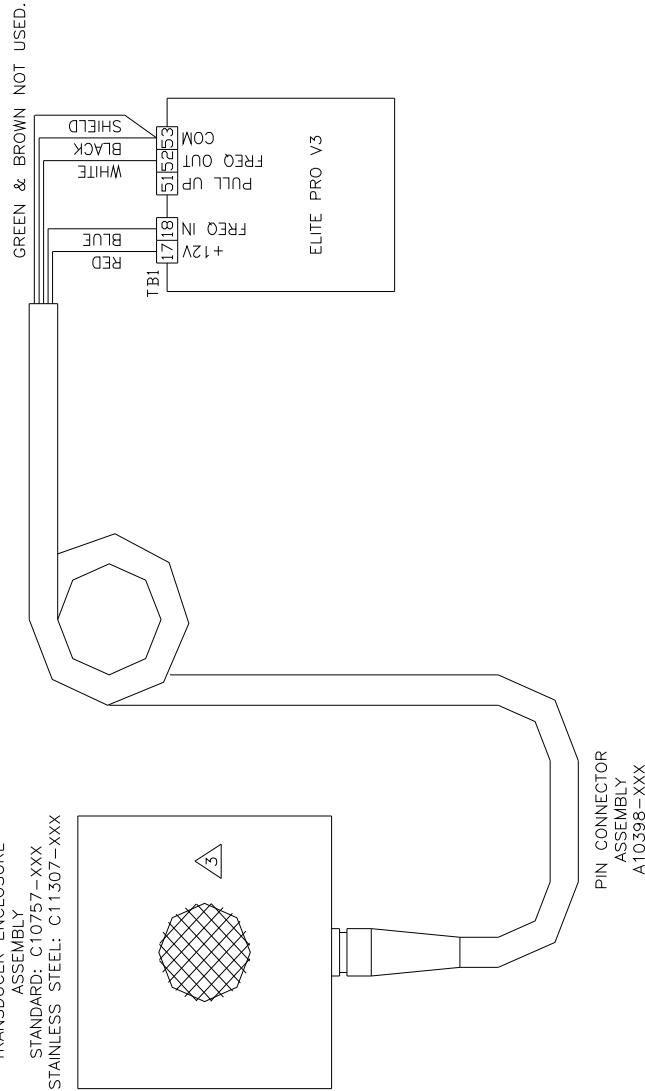


A SINCE MASTER IS AT ONE END OF DAISY CHAINED BUS IN THIS EXAMPLE, ITS TERMINATING RESISTOR SHOULD BE ACTIVE (SWITCHED IN). IF MASTER DOES NOT PROVIDE TERMINATING RESISTOR INTERNALLY, ONE MAY NEED TO BE PROVIDED EXTERNALLY. (RECOMMENDED VALUE: 120 OHMS). REFER TO MASTER DOCUMENTATION FOR FURTHER DETAILS.

2. MAXIMUM TOTAL NETWORK LENGTH: 4000 FEET.

149

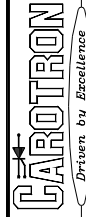
TRANSDUCER ENCLOSURE
ASSEMBLY
STANDARD: C10757-XXX
STAINLESS STEEL: C11307-XXX

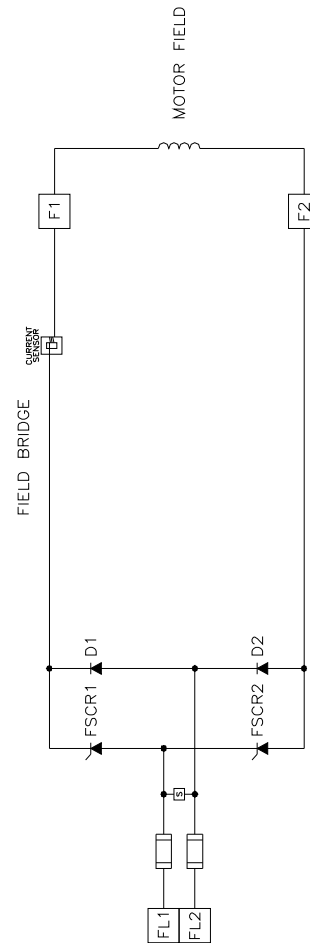
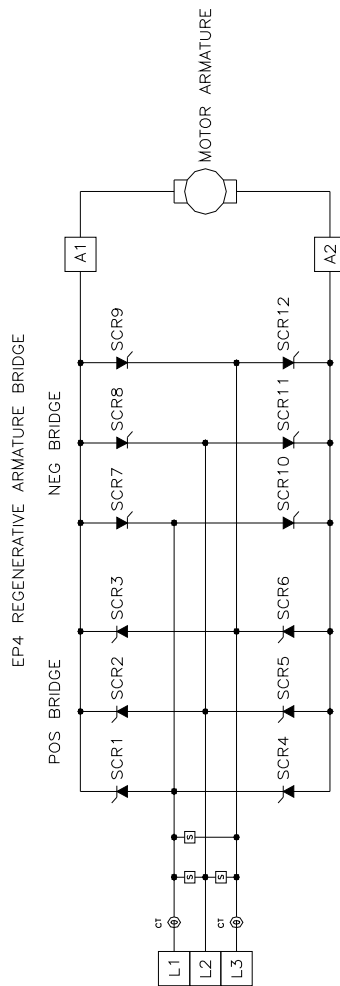
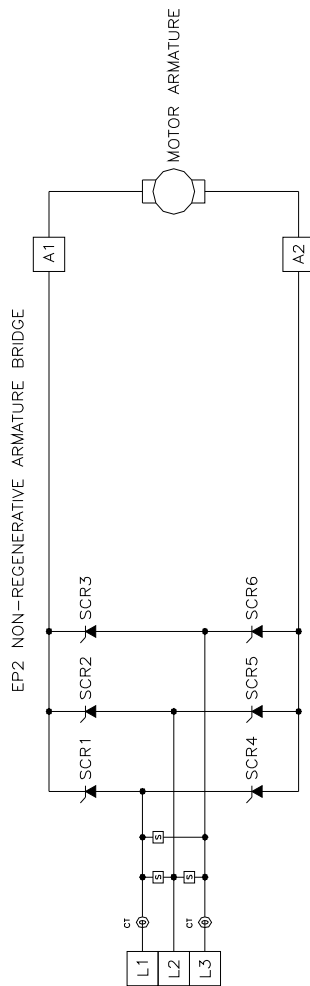


NOTES:

1. ELITE PRO FREQUENCY/DIGITAL OUTPUT MUST BE CONFIGURED TO OUTPUT 7 HZ SIGNAL.
2. ELITE PRO FREQUENCY INPUT MUST BE IN THE SONIC MODE (B8.02=SONIC).
3. PLACE THE SONIC HEAD JUMPER IN THE 8-15V POSITION.

DRAWN BY: BKP		DATE: 04/18/16
APPROVED BY:		DATE:
TOLERANCES: #		
2 DEC PL. = .010"		
3 DEC PL. = .005"		
TITLE: ELITE PRO V3 SONIC TRANSDUCER CONNECTION DIAGRAM		
DRAWING NUMBER: C14307		
REV. A SH. 1 OF 1		

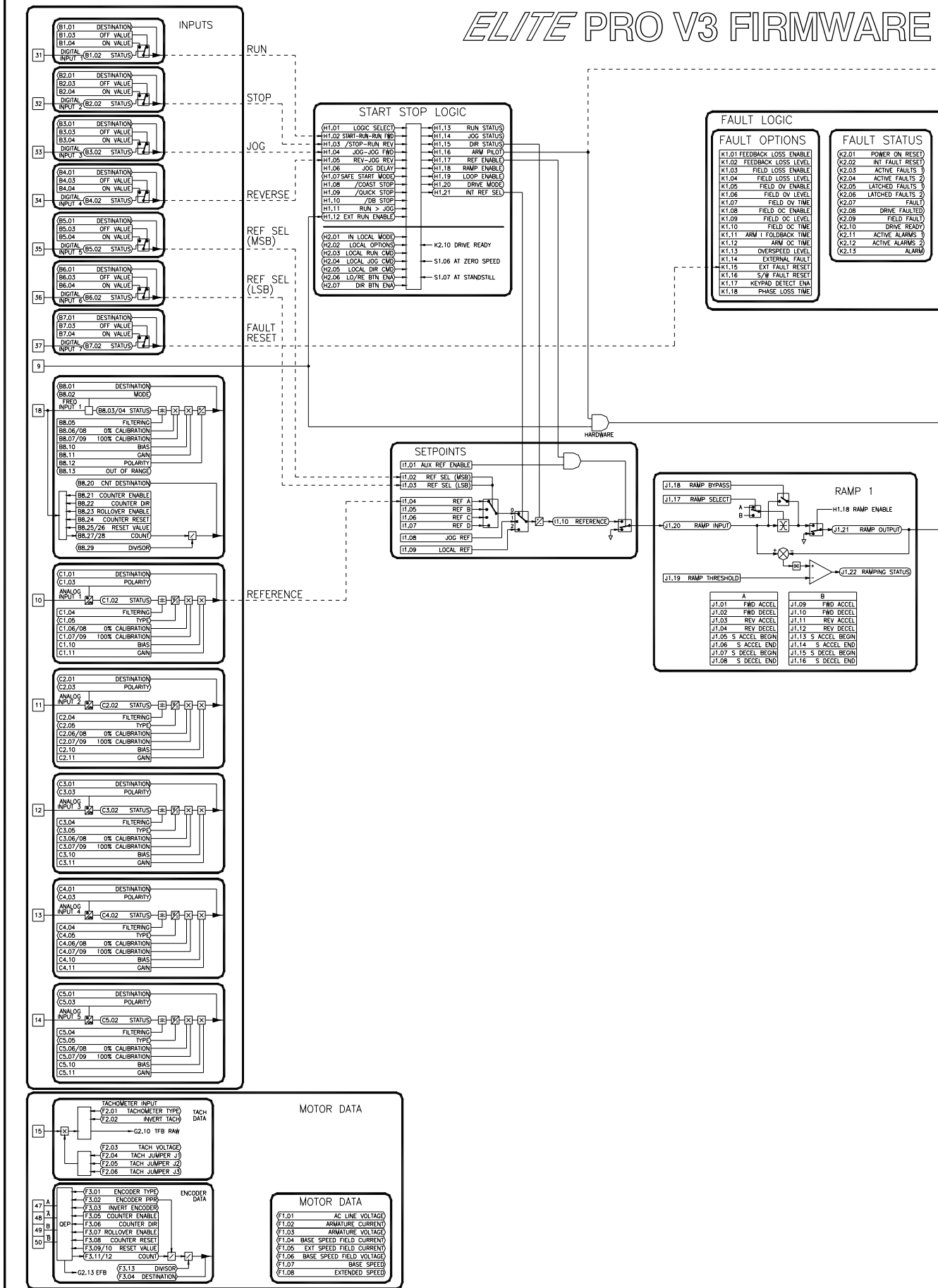




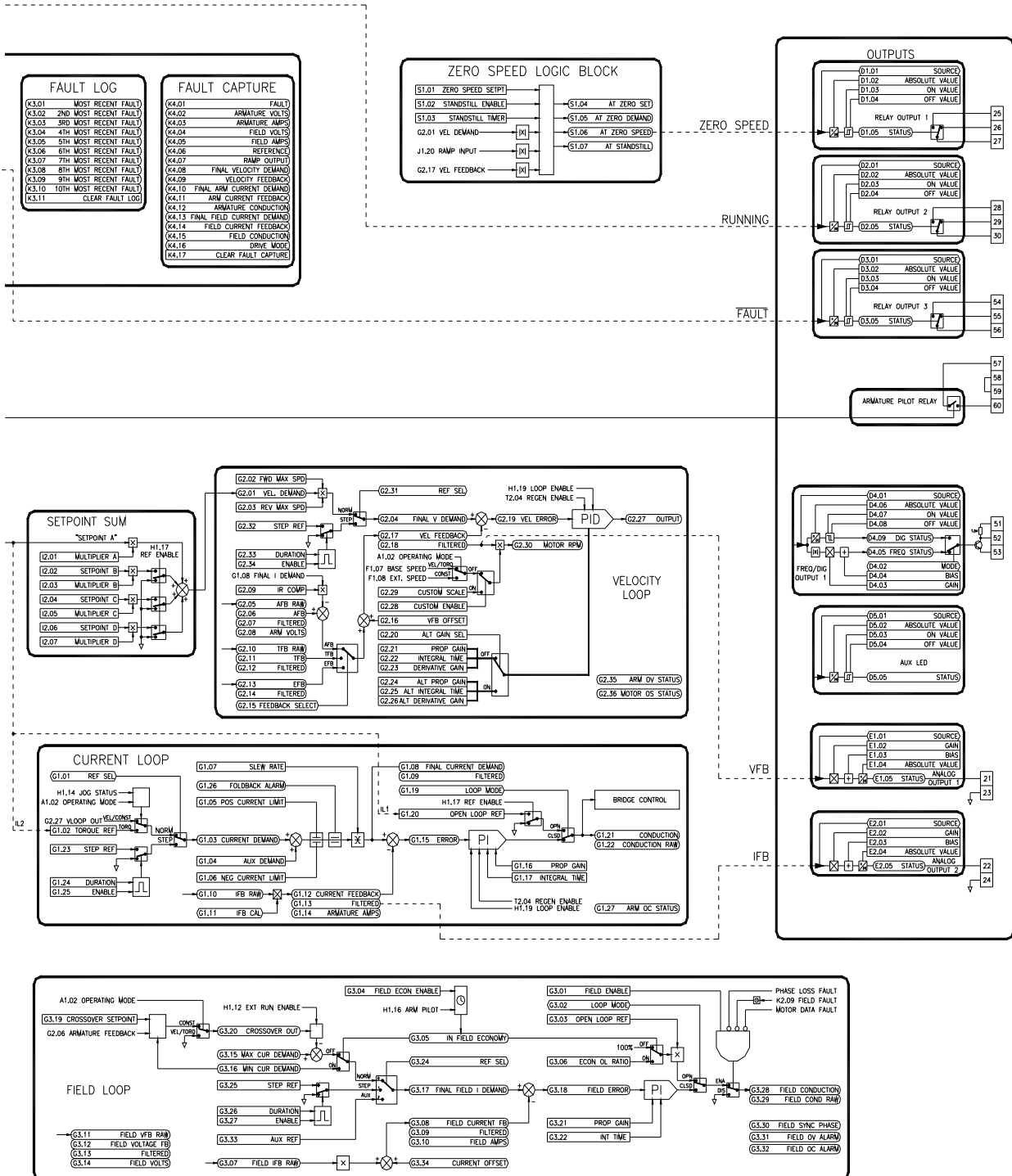
NOTES:
 [S] DENOTES RC SNUBBER

DRAWN BY: BKP	DATE: 10/18/17	 <i>Driven by Excellence</i> HEATH SPRINGS, SC 803-886-6063 FAX 803-886-6063
APPROVED BY:	DATE:	
TOLERANCES: .1 DEC. PL. = .010" .3 DEC. PL. = .005"		TITLE: ELITE PRO V3 POWER BRIDGE CONNECTIONS
SCALE:		DRAWING NUMBER: C14461
REV. A		SH. 1 OF 1

ELITE PRO V3 FIRMWARE



BLOCK DIAGRAM



REV. B, ADDED K1.18, 10/12/22

DRAWN BY: **BKP**
DATE: **6/23/14**

APPROVED BY: _____
DATE: _____

TOLERANCES: ±
2 DEC. PL. = .010"
3 DEC. PL. = .005"

SCALE: _____

DRAWING NUMBER: **D14309**

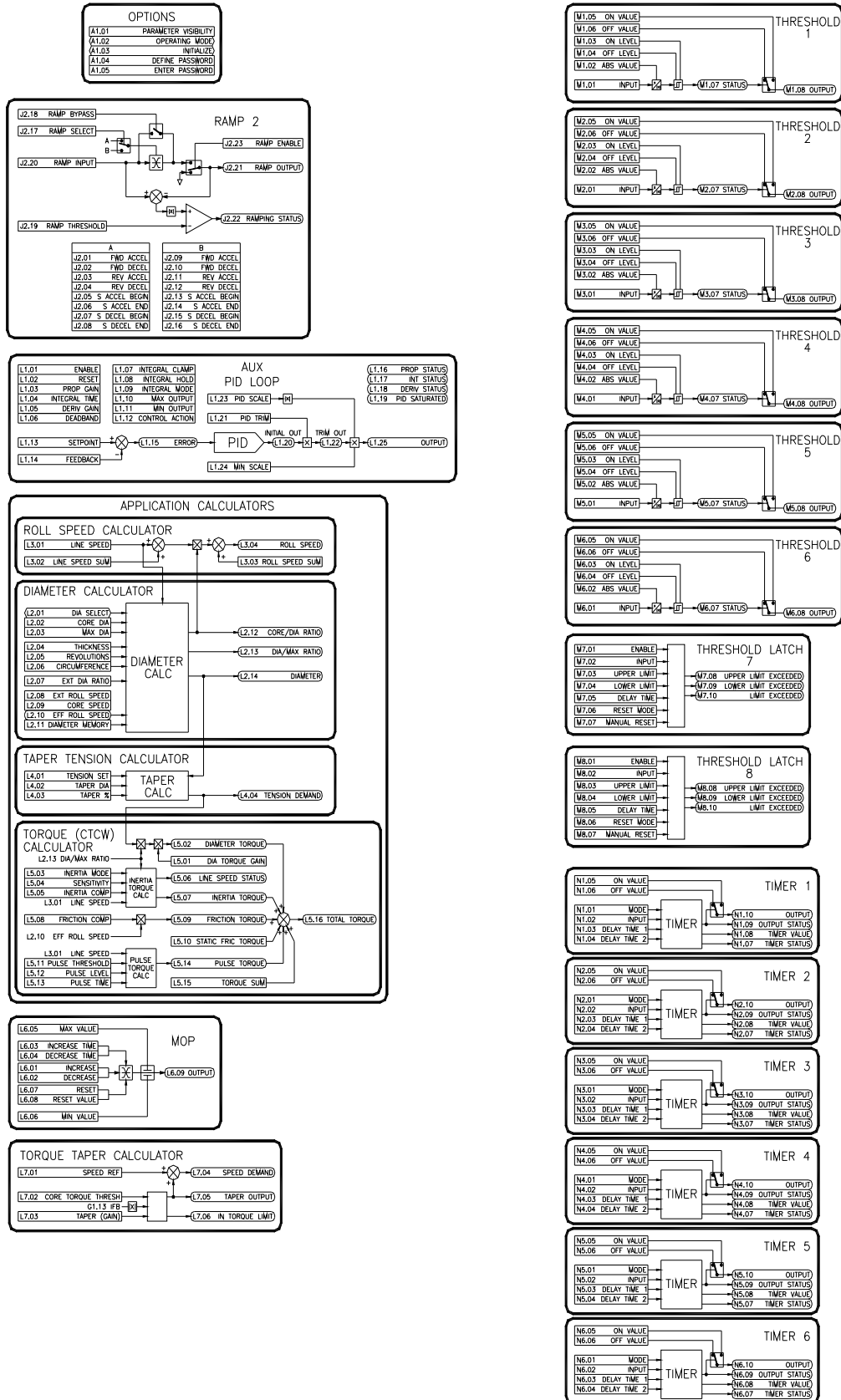
CAROTRON
Driven by Excellence

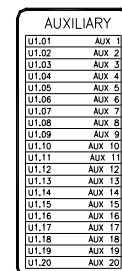
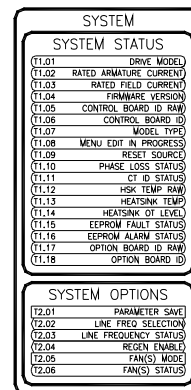
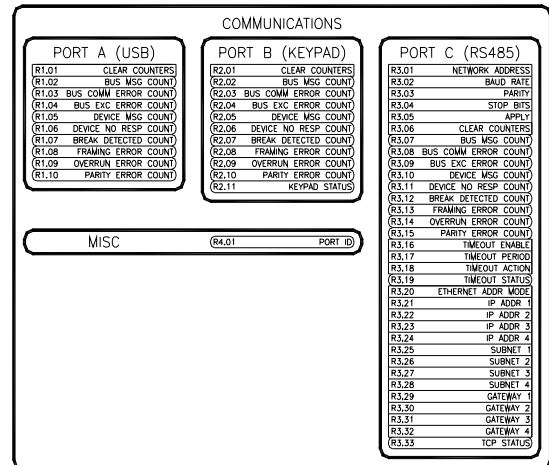
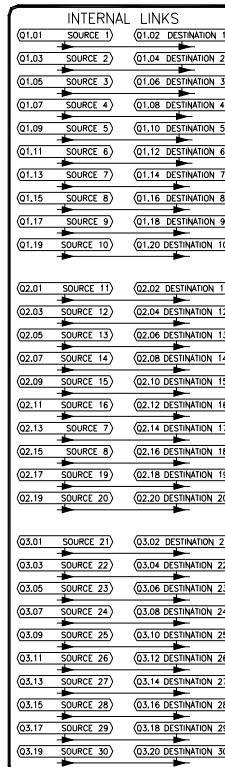
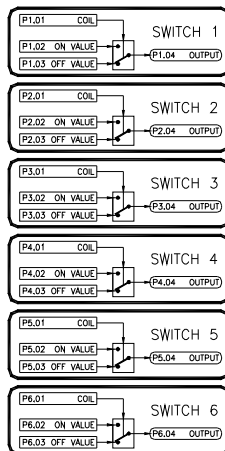
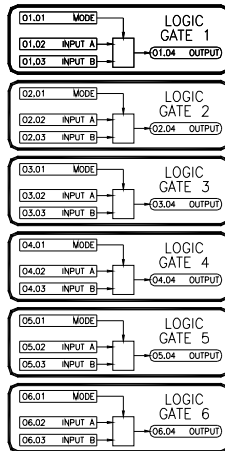
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063

TITLE: **ELITE PRO V3
SOFTWARE BLOCK
DIAGRAM**

REV. **B**

SH. **1** OF **2**





REV. C, 7/11/22, ADDED L7 AND REVISED R3(V3.23)
REV. B, 4/9/19, CTCW ERROR CORRECTIONS

DRAWN BY: BKP		DATE: 6/23/14	 Driven by Excellence
APPROVED BY:		DATE:	
TOLERANCES: 2 DEC. PL. = .010" 3 DEC. PL. = .005"		HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063	
SCALE:		TITLE: ELITE PRO V3 SOFTWARE BLOCK DIAGRAM	
DRAWING NUMBER: D14309		REV. B	SH. 2 OF 2

Notes

Standard Terms & Conditions of Sale

1. General

The Standard Terms and Conditions of Sale of Carotron, LLC. (hereinafter called "Company") are set forth as follows in order to give the Company and the Purchaser a clear understanding thereof. No additional or different terms and conditions of sale by the Company shall be binding upon the Company unless they are expressly consented to by the Company in writing. The acceptance by the Company of any order of the Purchaser is expressly conditioned upon the Purchaser's agreement to said Standard Terms and Conditions. The acceptance or acknowledgement, written, oral, by conduct or otherwise, by the Company of the Purchaser's order shall not constitute written consent by the Company to addition to or change in said Standard Terms and Conditions.

2. Prices

Prices, discounts, allowances, services and commissions are subject to change without notice. Prices shown on any Company published price list and other published literature issued by the Company are not offers to sell and are subject to express confirmation by written quotation and acknowledgement. All orders of the Purchaser are subject to acceptance, which shall not be effective unless made in writing by an authorized Company representative at its office in Heath Springs, S.C. The Company may refuse to accept any order for any reason whatsoever without incurring any liability to the Purchaser. The Company reserves the right to correct clerical and stenographic errors at any time.

3. Shipping dates

Quotation of a shipping date by the Company is based on conditions at the date upon which the quotation is made. Any such shipping date is subject to change occasioned by agreements entered into previous to the Company's acceptance of the Purchaser's order, governmental priorities, strikes, riots, fires, the elements, explosion, war, embargoes, epidemics, quarantines, acts of God, labor troubles, delays of vendors or of transportation, inability to obtain raw materials, containers or transportation or manufacturing facilities or any other cause beyond the reasonable control of the Company. In no event shall the Company be liable for consequential damages for failure to meet any shipping date resulting from any of the above causes or any other cause.

In the event of any delay in the Purchaser's accepting shipment of products or parts in accordance with scheduled shipping dates, which delay has been requested by the Purchaser, or any such delay which has been caused by lack of shipping instructions, the Company shall store all products and parts involved at the Purchaser's risk and expense and shall invoice the Purchaser for the full contract price of such products and parts on the date scheduled for shipment or on the date on which the same is ready for delivery, whichever occurs later.

4. Warranty

The Company warrants to the Purchaser that products manufactured or parts repaired by the Company, will be free, under normal use and maintenance, from defects in material and workmanship for a period of one (1) year after the shipment date from the Company's factory to the Purchaser. The Company makes no warranty concerning products manufactured by other parties.

As the Purchaser's sole and exclusive remedy under said warranty in regard to such products and parts, including but not limited to remedy for consequential damages, the Company will at its option, repair or replace without charge any product manufactured or part repaired by it, which is found to the Company's satisfaction to be so defective; provided, however, that (a) the product or part involved is returned to the Company at the location designated by the Company, transportation charges prepaid by the Purchaser; or (b) at the Company's option the product or part will be repaired or replaced in the Purchaser's plant; and also provided that (c) the Company is notified of the defect within one (1) year after the shipment date from the Company's factory of the product or part so involved.

The Company warrants to the Purchaser that any system engineered by it and started up under the supervision of an authorized Company representative will, if properly installed, operated and maintained, perform in compliance with such system's written specifications for a period of one (1) year from the date of shipment of such system. As the Purchaser's sole and exclusive remedy under said warrant in regard to such systems, including but not limited to remedy for consequential damages, the Company will, at its option, cause,

without charges any such system to so perform, which system is found to the Company's satisfaction to have failed to so perform, or refund to the Purchaser the purchase price paid by the Purchaser to the Company in regard thereto; provided, however, that (a) Company and its representatives are permitted to inspect and work upon the system involved during reasonable hours, and (b) the Company is notified of the failure within one (1) year after date of shipment of the system so involved.

The warranties hereunder of the Company specifically exclude and do not apply to the following:

- a. Products and parts damaged or abused in shipment without fault of the Company.
- b. Defects and failures due to operation, either intentional or otherwise, (1) above or beyond rated capacities, (2) in connection with equipment not recommended by the Company, or (3) in an otherwise improper manner.
- c. Defects and failures due to misapplication, abuse, improper installation or abnormal conditions of temperature, humidity, abrasives, dirt or corrosive matter.
- d. Products, parts and systems which have been in any way tampered with or altered by any party other than an authorized Company representative.
- e. Products, parts and systems designed by the Purchaser.
- f. Any party other than the Purchaser.

The Company makes no other warranties or representation, expressed or implied, of merchantability and of fitness for a particular purpose, in regard to products manufactured, parts repaired and systems engineered by it.

5. Terms of payment

Standard terms of payment are net thirty (30) days from date of the Company invoice. For invoice purposed, delivery shall be deemed to be complete at the time the products, parts and systems are shipped from the Company and shall not be conditioned upon the start up thereof. Amounts past due are subject to a service charge of 1.5% per month or fraction thereof.

6. Order cancellation

Any cancellation by the Purchaser of any order or contract between the Company and the Purchaser must be made in writing and receive written approval of an authorized Company representative at its office in Heath Springs, S.C. In the event of any cancellation of an order by either party, the Purchaser shall pay to the Company the reasonable costs, expenses, damages and loss of profit of the Company incurred there by, including but not limited to engineering expenses and expenses caused by commitments to the suppliers of the Company's subcontractors, as determined by the Company.

7. Changes

The Purchaser may, from time to time, but only with the written consent of an authorized Company representative, make a change in specifications to products, parts or systems covered by a purchase order accepted by the company. In the event of any such changes, the Company shall be entitled to revise its price and delivery schedule under such order.

8. Returned material


If the Purchaser desires to return any product or part, written authorization thereof must first be obtained from the Company which will advise the Purchaser of the credit to be allowed and restocking charges to be paid in regard to such return. No product or part shall be returned to the Company without a "RETURN TAG" attached thereon which has been issued by the Company.

9. Packing

Published prices and quotations include the Company's standard packing for domestic shipment. Additional expenses for special packing or overseas shipments shall be paid by the Purchaser. If the Purchaser does not specify packing or accepts parts unpacked, no allowance will be made to the Purchaser in lieu of packing.

10. Standard transportation policy

Unless expressly provided in writing to the contrary, products, parts and systems are sold f.o.b. first point of shipment. Partial shipments shall be permitted, and the Company may invoice each shipment separately. Claims for non-delivery of products, parts and systems, and for damages thereto must be filed with the carrier by the Purchaser. The Company's responsibility therefor shall cease when the carrier signs for and accepts the shipment.



CAROTRON

Driven by Excellence

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

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