CORTEX®
INDUSTRIAL
SYSTEM CONTROLLER
Dancer Position
Control

Instruction Manual

Model CORTEX-C00

CAROTRON

Driven by Excellence

D.C. DRIVES, A.C. INVERTERS,
SOLID STATE STARTERS, SYSTEM INTEREACE
CIRCUITS AND ENGINEERED SYSTEMS

Table of Contents

1 General Description

Model CORTEX-C00 is a microprocessor based Dancer Position Control with adjustable proportional, integral and derivative functions. The advanced mathematical models designed into the CORTEX-C00 give it many advantages over Carotron's Model D10541-000 Dancer Position Card and other dancer controls in the market place. This advanced design makes the CORTEX-C00 an excellent choice for a wide range of dancer applications for control of Center Driven Unwinds, Center Driven Rewinds, Surface Driven Unwinds, Surface Driven Rewinds, speed compensation between driven nip rolls, and speed/torque control for a Slipping Core Winder. For Center Driven Unwind and Rewind applications, the CORTEX-C00 provides a programmable means of compensating motor speed for diameter changes. Multiple options are available for obtaining diameter information to use as speed compensation. Since motor speed is corrected for diameter, the CORTEX-C00 can be used with DC or AC velocity controlled drives for unwind and rewind application.

In the simplest mode of diameter compensation, the Cortex PID circuit provides a combination of speed trim and diameter calculation from the external dancer input. A Line Speed signal is divided by the calculated diameter and trimmed by the dancer position error circuits to adjust unwind or rewind motor speed. This method can be very effective and requires no external diameter sensing.

A second mode of diameter compensation allows an external diameter signal to be entered into the Cortex such as from a sonic device or a lay-on roll that measures diameter. Line Speed is then divided by the diameter and trimmed by the external dancer through the internal PID functions to provide unwind or rewind motor speed. This method can be helpful with odd shaped rolls, especially for driven unwind. It is also helpful when accurate diameter information is required with minimal operator interface.

A third method of diameter compensation is to provide a pulse signal proportional to revolutions of the unwind or rewind roll. These pulses can be calibrated for one count per turn of the roll and used in conjunction with material thickness, core diameter and max diameter to calculate roll diameter. Line Speed is then divided by the diameter and trimmed by the external dancer through the internal PID functions to provide unwind or rewind motor speed. This method can provide very accurate diameter information, but requires operator input for starting parameters such as core diameter, max diameter and material thickness.

For applications where diameter compensation is used, the CORTEX-C00 can also provide a signal for adjusting the air loading for an external pneumatic dancer. This loading signal can then be used to set constant or tapered dancer tension based on roll diameter. The Frequency Output from the Cortex provides the loading signal, which must be converted by appropriate equipment to set the dancer air pressure for tension control.

For Surface Driven Unwind and Rewind applications, there is no need to compensate for diameter. This also holds true for Surface Driven Nip Rolls. Motor speed is related directly to a Line Speed signal as trimmed by the external dancer through the internal PID circuits. The mathematical model designed into the Cortex keeps all of the PID trim functions proportional to Line Speed for stability.
The CORTEX-C00 can also provide a simple set-up to control a Slipping Core Winder. Slipping Core Winders require speed control and torque control based on roll diameter. In this application, there is no requirement for an external dancer and the PID functions are set to zero. Winder Speed is calculated by dividing Line Speed by diameter and is output via the Analog Output from the Cortex. Diameter either can be calculated by a pulse per revolution counter in conjunction with material thickness and core diameter, or be directly input from an external diameter sensor. A torque output command proportional to diameter for constant or taper tension can be output via the Frequency Output from the Cortex. This frequency signal can be converted to a pressure signal when used with the appropriate converting equipment.

2 Specifications

2.1 Electrical

A.C. Input
Internally fused at 0.3 Amps
• 115 VAC ± 10%, 50/60 Hz ± 2 Hz
• 230 VAC ± 10%, 50/60 Hz ± 2 Hz

Analog Inputs (4)
• Voltage inputs: 10 VDC max
• Current inputs: 20 mADC max
• Nominal +10VDC supply @ 5.0mA

Digital Inputs (6)
Sink Mode
• Vil=3.0 VDC max @ 2.7mA
• Vih=5.0 VDC min to 30.0 VDC max @ 2.5mA
Source Mode
• Vil=3.0 VDC max @ 0.7mA
• Vih=5.0 VDC min to 30.0 VDC max @ 1.0mA
Digital Input Reference
• Internal: Nominal +24 VDC supply @ 200mA
• External: 5.0 - 30.0 VDC

Frequency Inputs (2)
• Frequency: 32kHz max, zero crossing square wave
• Voltage: 12 VDC max
• Sinking current required: 1.5mA min
• Nominal +12VDC supply @ 300mA

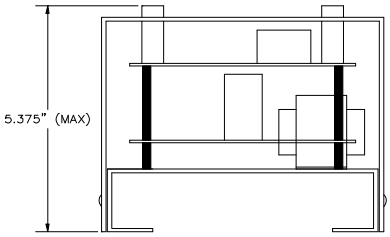
Relay Outputs (4)
Form-C contact:
• 3 A @ 115 VAC
• 3 A @ 30 VDC

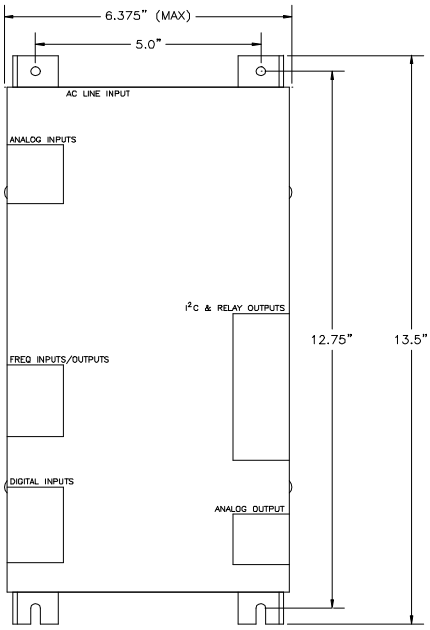
Analog Output
• 10 VDC max (voltage mode)
• 20 mADC max (current mode)
• External Voltage Reference -10.0 to +10.0 VDC

Frequency Output
• External Voltage Reference: 0 to 16.0 VDC
• Output Frequency: 2kHz max, zero crossing square wave
• Output current: 50mA max

I²C Expansion Bus
• Nominal +12 VDC supply @ 300mA

2.2 Physical





3 Installation

The Cortex should be installed in accordance with the National Electric Code and any applicable local or state codes.

WIRING PRECAUTIONS:

Use shielded cable for all analog, digital, and frequency inputs and outputs. Connect the shield to circuit common at the receiving end only. Please note that there are 6 different isolated sections on the Cortex. This allows unisolated drives, tachometers, etc... to be connected directly to the unit without the need for an isolation card. Each isolated common is designated on the included drawings with a unique number to distinguish one section from the others.
Any relays, contactors, motor starters, solenoids, etc. located in close proximity to or on the same A.C. line as the Cortex controller should have a transient suppression device in parallel with the coil to minimize interference with the unit.

TERMINAL CONNECTIONS:

TB1 (AC line input)
Terminals 1 and 4 are used for the AC line input. Either 115 or 230VAC input can be connected to these terminals. If 115VAC input is used, place a jumper between terminals 1 & 2 and also between terminals 3 & 4. If 230VAC input is used, place a jumper between terminals 2 & 3.

TB2 (Analog inputs)
There are 4 analog inputs on the Cortex, 2 voltage and 2 current. Terminals 1 and 6 provide the +10VDC supply and the common connection respectively. Terminals 2 and 4 are the voltage inputs and terminals 3 and 5 are the current inputs.

TB3 (Frequency output)
Terminal 2 is the frequency output signal and terminal 3 is the common. An external voltage up to 16 VDC must be supplied at terminal 1.

TB4 (Frequency inputs)
Terminal 2 is the frequency #1 input, and terminal 3 is the frequency #2 input. Terminals 1 and 4 provide a nominal +12VDC supply and the common connection respectively.

TB5 (Digital inputs)
Terminals 1 through 6 provide the six digital inputs, and terminal 7 provides the common connection. When configured with the INTERNAL reference, terminal 8 provides a nominal +24VDC level to be used with the digital inputs. If desired, an external signal up to +30 VDC can be used by selecting EXTERNAL reference. Terminal 8 then becomes an input for the external voltage signal.

TB6 (I^2C Bus)
This expansion port can be used to supplement the Cortex with additional inputs and outputs along with other interface options. Terminal 1 is the SDA or signal data line and terminal 4 is the SCL or signal clock line. Terminals 2 and 3 provide a +12VDC signal and circuit common respectively.

TB7 (Relay Contacts)

Relay #1 contacts:	Normally closed	Terminal 1
	Normally open	Terminal 2
	Wiper	Terminal 3
Relay #2 contacts:	Normally closed	Terminal 4
	Normally open	Terminal 5
	Wiper	Terminal 6
Relay #3 contacts:	Normally closed	Terminal 7
	Normally open	Terminal 8
	Wiper	Terminal 9
Relay #4 contacts:	Normally closed	Terminal 10
	Normally open	Terminal 11
	Wiper	Terminal 12

TB8 (Analog Output)
Terminal 3 is the analog output signal. When configured as a voltage output, the common connection should be connected to terminal 4. When configured as a current output, the current return signal should be connected to terminal 5. If desired, an external voltage signal can be applied to trim the analog output. This is achieved by applying the signal to terminal 1 and configuring the output reference to EXTERNAL. Terminal 2 provides an extra common connection.

4 Operating Modes

Enable Mode
In the enable mode, the PID functions are activated and output as an analog signal. The programmable enable relay energizes in this mode.

Fault Mode
The Cortex provides a digital fault input and a programmable fault relay. If at any time the fault input is activated or the dancer input limits are exceeded for a programmable time period, the Cortex will enter the fault mode and de-energize the fault relay.

Tension/Taper Control
On systems with E/P pressure loading of the dancer, the frequency output can be used to control the tension on the web. In some cases, a decreasing tension or taper tension is desirable to prevent telescoping and/or wrinkling of inner layers of material. The Cortex unit can be programmed to provide taper tension up to 100% starting at any point in the roll.

Batch Function (Optional)
The Cortex can be programmed to run a desired length of material. This option requires a pulse train generated by an external wheel riding on the web. This allows the Cortex to measure the length of material on the roll. Two programmable relay outputs are available for the batch function. The BATCH SLOWDOWN relay signals when the roll is nearing completion, and can be used to switch the line drive to a slower speed. The BATCH COMPLETE relay then signals that the desired length of material has been obtained.

5 Programming & Adjustments

The Cortex contains an RS232 communication port for serial communication to and from the unit. This communication port is used in conjunction with a handheld programmer, panel mount programmer, or a personal computer to configure the Cortex's operating parameters. A standard 9 pin communication cable is required to connect the Cortex to a PC. When power is applied, the unit goes into an initialization process and then displays the first monitoring screen. Please refer to drawing D11924 in Section 8 for visual representation of the menu structure.

MENU
After the initial power up, the display will show the first monitoring screen and may contain items such as line speed, output speed, diameter, and operating mode. The user can scroll through the monitoring screens and the QUICK MENU by using the 'D' and 'E' keys. The 'D' key will take you to the previous screen and the 'E' key will take you to the next screen. Pressing the 'E' key will change the display to the next monitoring screen showing the setpoint, dancer, error, PID, and output readings. The values range from 0.00-1.00, which correspond to 0-100%.

There are two additional optional monitoring screens showing tension and batch readings. These screens can only be accessed when the appropriate tension or batch function on the Cortex is enabled.

If the PASSWORD ENABLE parameter is set to 'yes', pressing the 'E' key again will take you back to the first monitoring screen. If the password enable is not on, the QUICK MENU will be displayed. The QUICK MENU contains parameters that may require changing frequently. The softkeys are used to navigate through the menu and set values. When the NEXT softkey is pressed at the last QUICK MENU screen (batch slowdown), the display will return to the first monitoring screen. To gain access to the QUICK MENU when the password protection is on, press the 'ENTER' key while at one of the monitoring screens. Enter the QUICK MENU password when prompted.

The MAIN MENU is accessed by pressing the 'ENTER' key. If the PASSWORD ENABLE selection is set to 'yes', the menu password has to be entered to gain access. Otherwise, the MAIN MENU screen is displayed and 8 options are given allowing the inputs, outputs, and functionality of the Cortex to be defined. Once an option is chosen, the appropriate menu screen is displayed. When in the menu, the top 5 keys (A,B,C,D, and E) act as 'soft keys'. The function of each soft key is indicated by the text immediately above each key in the bottom row of the display. The softkeys are used to navigate through the menu and set options. Note: As a safety precaution, many of the parameters in the I/O section can only be modified when the Cortex is in the DISABLE mode. The following contains a description of each menu screen and the function of each parameter.

MAIN MENU

1-INPUTS ..... Configures the analog, frequency, and digital inputs.
2-OUTPUTS ..... Configure the analog, frequency, and relay outputs.
3-OPTIONS ..... Configure the operating, fault, and batch parameters.
4-PID ..... Configure the PID and deadband settings.
5-DISPLAY ..... Set monitoring preferences.
6-SYSTEM ..... Set security passwords.
7-FILE ..... Load and Save user configurations.
8-EXIT ..... Return to the monitoring screens.

1. INPUTS

The digital inputs can be configured by pressing the DIGITAL softkey and the analog and frequency inputs are configured by pressing the ANALOG/FREQ softkey. The MAIN softkey will take you back to the MAIN menu.

DIGITAL INPUT VOLTAGE

Selects the source of voltage used on the digital input section. An internal unregulated nominal voltage of +24VDC is the factory preset and is accessed at TB5 terminal 8. If desired, an external voltage can be used by selecting external and applying the voltage at TB5 terminal 8.

DIGITAL INPUT LOGIC

Selects the type of logic for the external devices used on the digital inputs. The factory preset is SOURCE which sets the digital inputs low and the external input device must

SOURCE or drive the input high when activated. An example of this is simply a switch connected to a digital input and the voltage source at TB5 terminal 8. The SINK selection sets the digital inputs at a high state and the external input device must SINK or pull down the input when activated. An example of this is simply a switch connected to a digital input and the common terminal at TB5 terminal 7.

DIGITAL INPUTS 1 - 6

Each digital input may be configured to provide various functions. Digital inputs 1-5 are programmable and can perform the functions listed below. The FUNC softkey allows the user to scroll through a list of unused functions. Digital input 6 is the enable input. Each digital input may also be configured to be on (active) when the external device or switch is in the open or closed position. Normally open switches should be configured as 'CLOSED=ON' and normally closed switches should be configured as 'OPEN=ON'. The TYPE softkey allows configuration. The factory preset is 'CLOSED=ON'.

Off

The input has no function.

Bit 1, Bit2, Bit3

These input functions can be used to select and load a user defined parameter set. When all are used, up to 8 different configurations are possible. Bit1 has a binary weight of 1, bit 2 has a binary weight of 2, and bit 3 has a binary weight of 4.

Load

The load function signals the Cortex to load the user defined parameter set that corresponds to the 3 bit binary word described above. If no load function is defined, the Cortex will load a new parameter set whenever there is a change in state of one of the three bits. Please note that the load function is inactive when the user is in the menu. Any external load or bit switching signals will be ignored until the user returns to the monitoring screens. **Carotron recommends only using the LOAD function when the digital inputs are programmed for sourcing logic. If sinking logic is required, the desired parameter set should be reloaded after any power loss condition.**

Fault

The fault function can be used to signal the Cortex of an external fault condition. This will cause the Cortex to immediately clamp its output to zero and de-energize any programmed fault relays.

Fault Override

The fault override function can be used to override an external or internal fault condition.

Batch Reset

The batch reset function is used to reset the batch length counter.

Memory Reset

The memory reset function is used to manually reset the integral and diameter

memories. An automatic reset is also available and is described in the OPTIONS section.

VOLTAGE 1 INPUT, CURRENT 1 INPUT,
VOLTAGE 2 INPUT, CURRENT 2 INPUT,
FREQUENCY 1 INPUT, FREQUENCY 2 INPUT

Each of the 4 analog inputs (2 voltage, 2 current) and 2 frequency inputs can be configured to provide certain functions. The FUNC softkey scrolls through a list of available functions. Please note that if an input function is not displayed as you scroll through the list, it is already assigned to a different input. The function must be first unassigned before it can be reassigned to a new input.

After a function has been chosen, the CAL softkey allows the Cortex to calibrate the input. The Cortex can automatically measure the minimum and maximum levels by choosing AUTO. The Cortex will prompt you to input the minimum signal level and then press OK. It will then prompt you to input the maximum signal level. Again when this is done, press OK. Note: The calibration routine can only be run when the unit is in the DISABLE mode.

The Cortex also allows the user to manually set or adjust these minimum and maximum signal levels by pressing the MAN softkey. The levels are displayed and can be modified by pressing the SET softkey. Note that the 4 analog input levels have a resolution of 12 bits. The values can range from 0 to 4095 and correspond to an analog level of 0 to 10VDC or 0 to 20mADC. The frequency input levels are in Hertz and can range from 0 to 32,000 Hz.

Furthermore, the AVG softkey allows adjustment of the windowed or sliding average routine that is performed on the incoming signal. The size of the window is adjustable from 1 (no averaging) up to 255.

The following input functions are available as analog or frequency:

Off
The input has no function.

Position
The position input function is used to set the desired position of the dancer arm. The external position input is optional and can be configured to be an internal setting. (See OPTIONS).

Line Speed
The line speed input is used to provide a scaling input to the PID function. This allows the input to ratio or scale the output. Note that if this function is not assigned to an input, the Cortex will internally set this level to 100%.

Tension
On systems with E/P pressure transducers, the Cortex can provide a frequency signal for loading the dancer. The tension input function is used to set the desired

level of the tension output signal. The external tension input is optional and can also be configured to be an internal setting if desired. (See OPTIONS).

Diameter
When in the wind or unwind modes, an optional external diameter signal can be supplied to the Cortex.

Dancer
The dancer input function is a mandatory input signal that provides the feedback from the dancer arm.

The following input functions are available only as frequency inputs:

Output Speed Feedback
If desired, an optional feedback signal can be input to the Cortex. This signal can be used to monitor the speed of a line or winder.

The following input functions are available only on frequency input 2. Please also note that the calibration function is disabled when either of these functions are selected since they are simply counting pulses.

Revolution
As described above, a diameter signal can be provided to the Cortex. Another option is to provide a pulse per revolution input signal. The Cortex, when provided with the pulses per revolution and material thickness data can compute the diameter. Note that the diameter signal has precedence over the revolution input if both signals are functioning simultaneously.

Batch
The optional batch function can be used to allow the Cortex to run a desired length of material. A pulse train generated by an external wheel riding of the web allows the Cortex to calculate the length.

2. OUTPUTS

The analog outputs can be configured by pressing the ANALOG softkey and the relay and frequency outputs are configured by pressing the RELAY/FREQ softkey. The MAIN softkey will take you back to the MAIN menu.

ANALOG REFERENCE
Selects the reference source of voltage for the digital to analog converter. The factory preset is INTERNAL and selects a DC voltage level that allows an output up to 10VDC or 20mADC. If desired, an external voltage can be used to trim the output by selecting EXTERNAL. The external voltage should be applied to TB8 terminal 1.

ANALOG OUTPUT
Selects whether the analog output is voltage or current. The output is at TB8 terminal 3 regardless of the selection. However, the common or return connection should be made to terminal 4 for voltage and terminal 5 for current. The factory preset is VOLTAGE.

ANALOG OUTPUT BIAS
This menu screen is used to set a bias level for the analog output. The '+' and '-' softkeys are used to adjust the level up and down. The RES softkey will toggle the resolution between a coarse and fine adjustment. The factory preset is 0%.

ANALOG OUTPUT GAIN
This menu screen is used to set the gain level for the analog output. The '+' and '-' softkeys are used to adjust the level up and down. The RES softkey will toggle the resolution between a coarse and fine adjustment. The factory preset is 100%.

FACTORY OFFSET
This parameter is used to zero the internal amplifier connected to the digital to analog output. This parameter is set at the factory and should not require re-adjusting.

FACTORY GAIN
This parameter is used to set the gain of the digital to analog signal to 10 VDC or 20 mADC. This parameter is set at the factory and should not require re-adjusting.

FACTORY BIAS
This parameter is used to bias the analog output to zero. This parameter is set at the factory and should not require re-adjusting.

RELAY #n FUNCTION (n = 1 - 4)
Each relay output may be configured to provide various functions. Below is a description of each function:

Off
The relay has no function and is de-energized.

On
The relay has no function and is energized.

Enable
This function can be used to control the wind, unwind, or surface drive. The relay is energized when in the ENABLE mode.

Fault
This function can be used to indicate a FAULT condition. The output is normally in an energized state and will de-energize in a FAULT condition. A fault condition can triggered by the external fault digital input or by the dancer signal exceeding its set limits.

Zero Speed
This function monitors the line speed input and is energized when the speed is below the adjustable ZERO SPEED SETPOINT and de-energized above it.

Taper
When in the WIND mode, this function energizes the relay when the taper function is active. This occurs when the actual roll diameter is greater than the TAPER DIAMETER.

Batch Slowdown
This function energizes the relay when the batch length has reached the BATCH SLOWDOWN percentage. The relay output can be used to switch to a slow line speed near the end of a batch run, in order to achieve precise batch lengths.

Batch Complete
This function energizes the relay when the batch run is complete.

FREQUENCY OUTPUT
This menu allows the user to select the function of the frequency output and to set the level of the maximum output. Pressing the FUNC key scrolls through a list of functions that are described below. The SET softkey allows the 100% frequency output level to be defined in Hertz. The frequency output range is 0 to 2000 Hz.

Off
The frequency output is disabled.

Tension
On systems with an E/P pressure transducer, the tension output can be used to control the loading on the dancer. The tension signal is always present even when the unit is disabled and also provides tapering tension if desired.

Torque
In the wind mode, the frequency output can provide a signal proportional to the diameter based torque of the winder drive.

Line Speed
The frequency output will be proportional to the line speed input signal.

Output Speed
The frequency output will be proportional to the output speed feedback signal.

Diameter
In the wind and unwind modes, the frequency output will be proportional to the roll diameter.

3. OPTIONS

1-OPERATING PARAMS ..... Configure operating parameters.
2-FAULT PARAMS..... Configure fault parameter options.
3-BATCH/REV..... Configure batch & revolution params.
4-MAIN ..... Return to the MAIN MENU.

1. OPERATING PARAMETERS

OPERATING MODE
Choose from wind, unwind, or surface modes.

POSITION SETPOINT
If no external position setpoint signal is provided to the Cortex, this internal setpoint is used.

TENSION SETPOINT
Optional menu parameter. If no external tension setpoint signal is provided to the Cortex, this internal setpoint is used. Press the UNITS softkey to scroll to the desired units. Note that the MAX TENSION parameter (see DISPLAY) should be set before adjusting the TENSION SETPOINT.

CORE DIAMETER
In the wind and unwind modes, the core diameter is entered here. Press the UNITS softkey to scroll to the desired units.

MAX DIAMETER
In the wind and unwind modes, the maximum diameter is entered here. Press the UNITS softkey to scroll to the desired units.

TAPER DIAMETER
In the wind mode, this parameter sets the starting point of the taper function. Press the UNITS softkey to scroll to the desired units.

PERCENT TAPER
In the wind and unwind modes, this parameter sets the amount of taper. If no taper is desired, set to 0.

LINE SPEED TRIM
This parameter is used to trim the affect that the line speed scaling input has on the final output.

MATERIAL THICKNESS
In the wind and unwind modes, the thickness of material is entered here. Please note that this is only required if a revolution pulse input is used to compute the roll diameter. Press the UNITS softkey to scroll to the desired units.

INVERT DANCER SIGNAL
This parameter is used to match the dancer sensing to the system. This ensures that when the dancer is out of position, the controlled drive will operate in the correct direction to bring the dancer back into position. When set to YES, the sense of the dancer is inverted.

AUTO MEMORY RESET
The integral and diameter calculations are held in memory when the unit is disabled. In order to reset these values, a manual reset can be activated by a digital input, or the unit can automatically reset these values when the unit is re-enabled.

ZERO SPEED SETPOINT
This parameter sets the level of line speed at which the zero speed relay energizes and de-energizes. A small hysteresis level is also provided to prevent 'chattering' of the relay.

2. FAULT PARAMETERS

DANCER LOWER LIMIT
This parameter defines the lower dancer limit at which a FAULT condition is generated. The limit can be disabled by setting it to 0%.

DANCER UPPER LIMIT
This parameter defines the upper dancer limit at which a FAULT condition is generated. The limit can be adjusted as high as 200% to disable.

INTERNAL FAULT TIMER
An internal fault is activated when the dancer exceeds either the upper or lower limits set above. If desired, the Cortex can be configured to only generate a fault condition if these limits have been exceeded for an adjustable time period. The time period is adjustable from 0 to 10 seconds.

EXTERNAL FAULT TIMER
An external fault can be activated by one of the digital inputs. If desired, the Cortex can be configured to only generate a fault condition if this input has been activated for an adjustable time period. The time period is adjustable from 0 to 10 seconds.

3. BATCH/REVOLUTION PARAMETERS

The following parameters are optional and will only require setting if the batch or revolution inputs are used. When the batch function is used, all 5 of the following parameters should be configured to your system. If the revolution function is used, only the PPR and ZS PULSE COUNT parameters need to be configured.

BATCH LENGTH
This parameter sets the desired length of the batch run. When this length has been reached, the batch complete relay is energized.

BATCH SLOWDOWN
When running the batch function, precise lengths can be obtained by switching to a lower line speed reference near the end of the batch run. This parameter sets the point, in a percentage of the batch length, at which the batch slowdown relay is energized.

BATCH WHEEL CIR. (Circumference)
If the batch function is used, this parameter sets the circumference of the wheel that rides on the surface of the web.

BATCH/REVOLUTION PPR (Pulses Per Revolution)
If the frequency 2 input is used for the revolution or batch counter, this parameter sets the number of pulses per revolution.

PULSE COUNT MODE
This parameter controls the direction of the batch/revolution counter. The UP and DOWN selections allow the batch/revolution input to be used on bi-directional systems. When the counter is configured as a revolution input, winders will set this parameter to UP and unwinders will set it to DOWN. When in the batch mode, the counter should normally be configured in the UP mode. The DOWN selection can be selected when temporarily reversing directions.

ZS (ZERO SPEED) PULSE COUNT
In some systems, such as a slipping core winder, it may be desired to not count the incoming pulses for the batch or revolution input when below the zero speed setpoint. This can be accomplished by turning this parameter off. The factory preset is on.

4. PID

PROPORTIONAL GAIN
This parameter sets the proportional response. Increasing this value increases the gain (increases the response rate). The factory preset is 40%.

INTEGRAL TIME
This parameter sets the integral response. Increasing this value increases the time (decreases the response rate). The factory preset is 60%.

DERIVATIVE RESPONSE
This parameter sets the rate at which the derivative responds. The factory preset is 0%.

DERIVATIVE LEVEL
This parameter sets the level of the derivative response. Increasing this value increases the effect on the output. The factory preset is 0%.

DEADBAND
This parameter sets a window in the response loop where the output is not affected by small changes in the dancer. Increasing this value increases the window. The factory preset is 50%.

PID TRIM RANGE
This parameter determines the sensitivity of the PID portion of the control loop.

5. DISPLAY

MAX LINE SPEED
Optional menu parameter. Used only when a line speed signal is applied to the unit. The Cortex monitors the line speed per one of its analog or frequency inputs. The line speed can be displayed as a percentage or in other useful units such as Feet/Min, Yards/Min, & Meters/Min. In order to display properly, the unit must first be calibrated with the 100% line speed value. Press the UNITS softkey to scroll through a list of predefined units and then press SET to enter the maximum line speed.

MAX OUTPUT SPEED
Optional menu parameter. Used only when a speed feedback signal is applied to the unit. The Cortex can monitor and display it as a percentage or in RPMs. In order to display properly, the unit must first be calibrated with the 100% RPM value. Enter the maximum winder speed in RPM.

MAX TENSION
Optional menu parameter. Used only when the frequency output function is set to tension. This parameter allows the user to set the maximum tension level that would be produced by the pressure loaded dancer with 100% tension signal. This calibrates the tension display and the TENSION SETPOINT setting. Available units are %, ounces, pounds, grams, & kilograms.

6. SYSTEM

CORTEX-C00
This menu screen displays the model number and the software versions.

PASSWORD ENABLE
This option allows the user to turn the password protection on or off. When turned on, the user must enter a password before access is given to either the main menu or the quick menu. The menu that is displayed depends on which password was entered.

MENU PASSWORD
The user can set the menu password at this screen.

QUICK MENU PASSWORD
The user can set the quick menu password at this screen.

TIME IN USE
The Cortex provides a real-time clock to keep track of how long a unit has been powered up.

FORCE A REINITIALIZATION
Choosing this option reinitializes the Cortex and loads the factory presets into all of the user parameter sets. Warning! Any custom configuration data contained in

the current or user sets will be lost.

ANALOG INPUT STATUS
This status screen displays the level of the two voltage inputs and the two current inputs in volts and milliamps.

FREQ INPUT STATUS
This status screen displays the level of the two frequency inputs in Hertz. If frequency input #2 is configured for a revolution or batch counter, the screen will display the number of pulses counted.

DIGITAL INPUT STATUS
This screen displays the internal status of the six digital inputs as on or off. The state takes into account the configuration of the digital input (closed=on or open=on).

RELAY OUTPUT STATUS
This screen displays the status of the four relay outputs as on or off. A relay is energized when in the 'on' state and is de-energized when in the 'off' state.

SIGNAL OUTPUT STATUS
This status screen displays the level of the analog output in percentage and the frequency output in Hertz.

7. FILE

FILE MENU
The Cortex allows the user to save up to 10 different configurations. This menu screen allows you to either load or save a configuration. The MAIN key returns you to the MAIN MENU. The monitoring screen that displays the operating mode also displays the current configuration set. For example, if user setup #0 is loaded, the display will show 'USER 0'. A 'USER x' indicates that a user set has been modified but not saved. Furthermore, if the factory presets are loaded, it will be indicated with 'FACTRY'.

LOAD USER SETUP
To load a previously saved configuration, press the CHANGE key until the user set number is displayed. Pressing the OK key will load the selected configuration into memory. The CANCEL key returns you to the previous menu.

SAVE USER SETUP
To save the current setup to a user configuration location, press the CHANGE key until the desired location is displayed and then press OK. The CANCEL key returns you to the previous menu.

6 Adjustment Procedure

WARNING!

The Cortex has 6 sections that are electrically isolated from each other. Any section that is connected to an un-isolated device (such as an un-isolated DC drive) can have high voltage potentials between earth ground and any point in the circuit and between other sections. All test instruments should be isolated from earth ground to prevent damage to the instrument or the control. Any instrument connected to the circuit is floating at potentials that approach the AC line voltage and should be handled with care.

STEP 1. SETUP INPUTS

Enter the MAIN MENU and select INPUTS and then DIGITAL. Configure each digital input for the desired function and type of input. Next, under the ANALOG/FREQ section, assign the dancer and any other desired functions to an input.

After a function has been assigned to an input, use the CAL softkey to calibrate the input. Initial calibration should be performed in the AUTO mode. If calibrating the line speed, the Cortex will prompt you to input the signal corresponding to 0% line speed and then press OK. Next, run the line up to 100% speed and again press OK. Make a note of the surface speed before stopping the line.

As above, when calibrating the dancer input, move the dancer by hand to input the minimum signal when prompted to do so. Press the OK softkey. Again, move the dancer to input the maximum signal and press OK.

If the winder speed feedback input is used, the input needs to be calibrated with the minimum and maximum signals as above. The analog output of the Cortex or a speed pot must be used to control the winder drive. The Cortex will prompt you to input the signal corresponding to 0% winder speed and then press OK. Next, use the '+' and '-' keys or the speed pot to adjust the core surface speed until it equals the maximum line speed. Make a note of the winder RPM before pressing OK.

Any other input functions that are assigned should be calibrated at this time. Please note that the revolution and batch functions on the frequency 2 input do not need calibrating.

STEP 2. SETUP OUTPUTS

At the MAIN MENU, enter the OUTPUTS section and configure the analog output. Initially, set the ANALOG REFERENCE and ANALOG OUTPUT parameters. Enter the RELAY/FREQ section and define the function of the relay outputs. Likewise, program the function and maximum level of the frequency output.

STEP 3. CALIBRATE DISPLAY (OPTIONAL)

At the MAIN MENU, enter the DISPLAY section. If the user desires to view the line speed, output speed, and tension signals in real world units instead of percentages, enter the 100% values that were measured in the calibration routines earlier.

STEP 4. PROGRAM OPTIONS

At the MAIN MENU, enter the OPTIONS section. In the OPERATING PARAMS section, configure the options per your system. Many of these parameters are optional and may not be required. Please refer to the descriptions earlier to determine if they apply to your system. Likewise, the FAULT and BATCH/REV PARAMS sections contain optional parameters that can be used if desired.

STEP 5. OPERATIONAL CHECKS

Position the dancer at the desired operating position. With no material in the machine, enable the system. Manually move the dancer in the direction that would cause the controlled drive to speed up. If the drive slows down, the INVERT DANCER SIGNAL parameter may need to be changed.

With the line stopped, thread the machine with scrap material. The web should not be too tight or slack. Enable the machine. The drive should move the dancer to the desired position for normal operation. If the dancer does not position properly, adjustments will have to be made in order to fine tune the operation. Most applications will only require adjusting the INTEGRAL RATE, DEADBAND, PROPORTIONAL GAIN, & ANALOG OUTPUT GAIN parameters. The DERIVATIVE RESPONSE and DERIVATIVE LEVEL parameters should only be adjusted in applications where the dancer responds too slowly.

STEP 6. PASSWORD (OPTIONAL)

The password option prevents unauthorized access to the MAIN MENU and QUICK MENU screens. The option is controlled by the PASSWORD ENABLE screen. The MENU PASSWORD and QUICK MENU PASSWORD screens allow a custom password to be entered.

STEP 7. FILE (OPTIONAL)

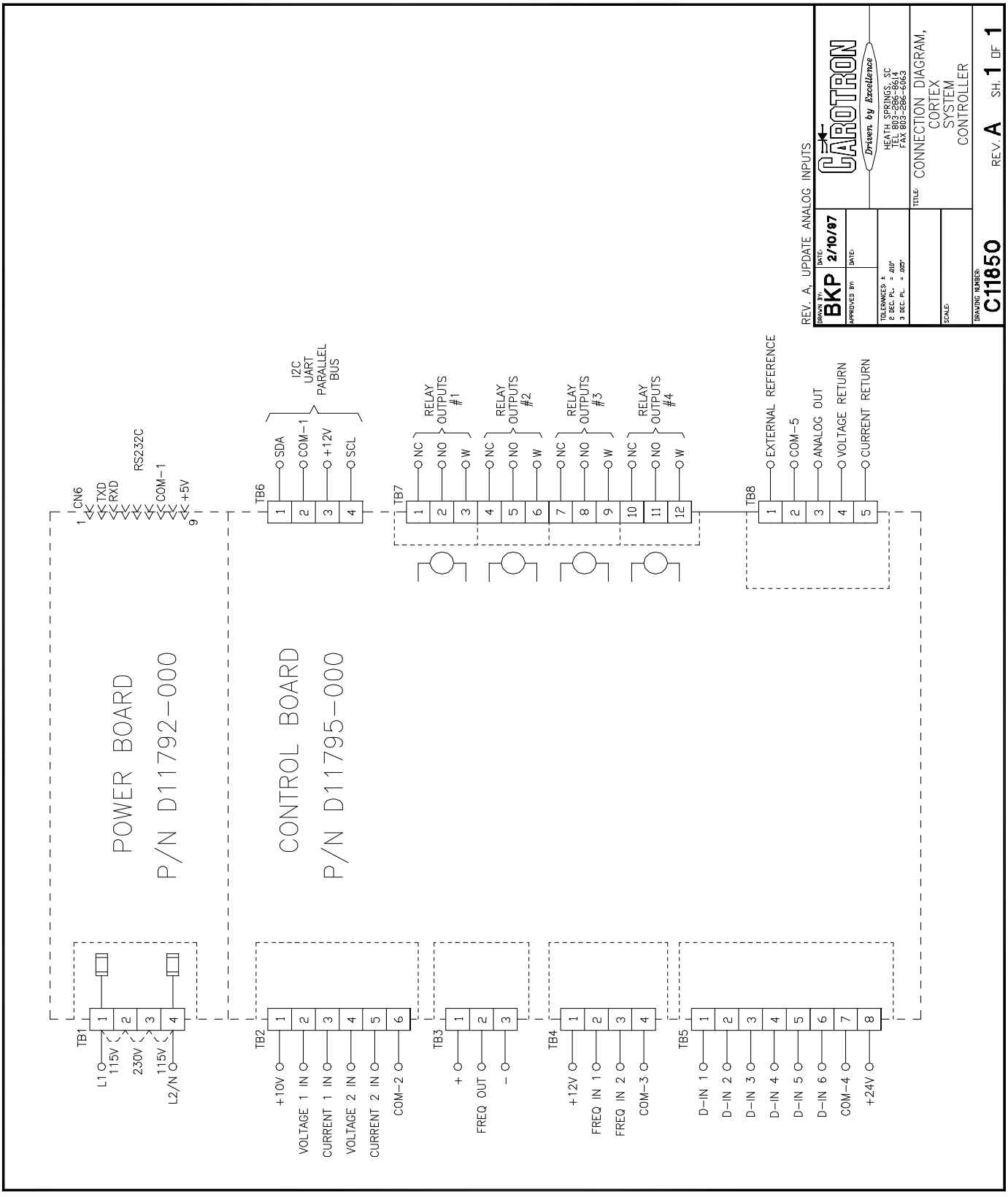
The Cortex allows up to 10 different configurations to be stored in memory for later recall. The SAVE option allows you to choose a location (0-9) to store the current configuration. Once saved, the configuration can be recalled by using the LOAD option from the menu or with a bit pattern/load signal on the digital inputs. The menu LOAD option also will allow you to reload the factory presets.

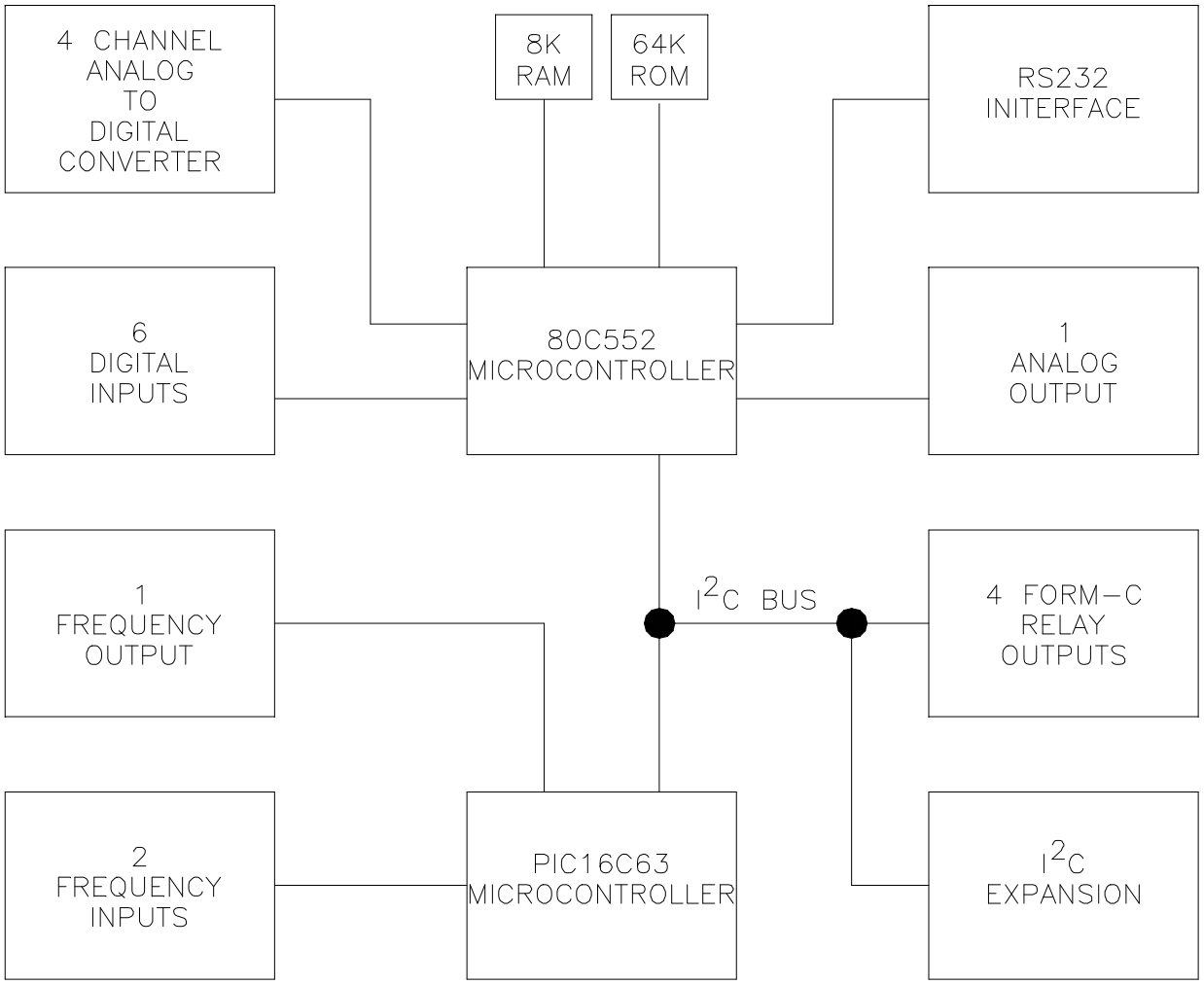
7 Spare Parts

Fuses: FU1 & FU2: 0.3 ampere, 250VAC, time-delay

Carotron FUS1006-01
Bussmann..... MDL 3/10 A
Littelfuse..... 313.300

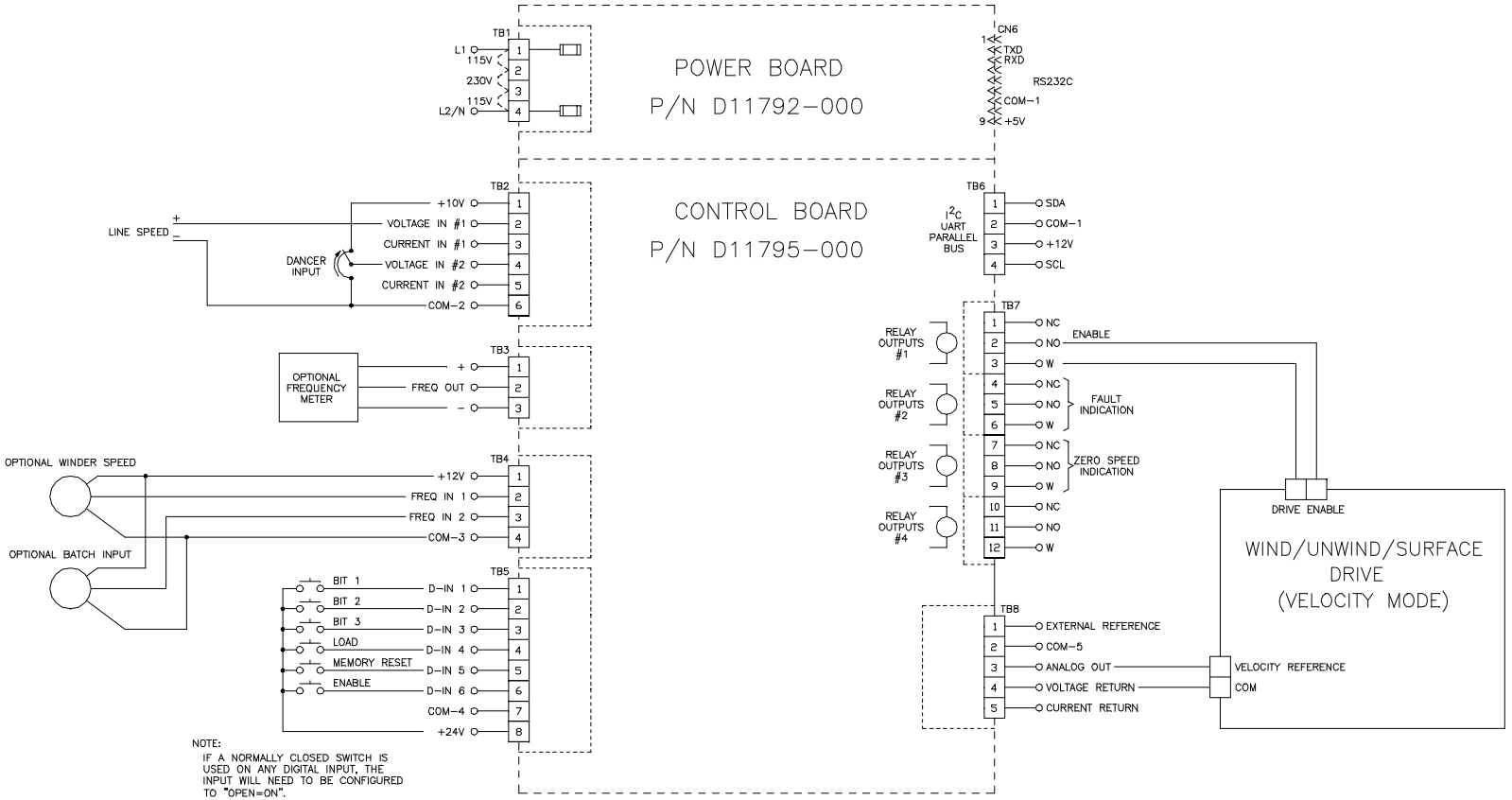
8 Prints


POWER BOARD
P/N D11792-000
CONTROL BOARD
P/N D11795-000
CN6
TXD
RXD
RS232C
COM-1
+5V
I2C
UART
PARALLEL
BUS
SDA
COM-1
+12V
SCL
RELAY OUTPUTS #1
RELAY OUTPUTS #2
RELAY OUTPUTS #3
RELAY OUTPUTS #4
NC
NO
W
EXTERNAL REFERENCE
COM-5
ANALOG OUT
VOLTAGE RETURN
CURRENT RETURN
TB1
L1
115V
230V
115V
L2/N
TB2
+10V
VOLTAGE 1 IN
CURRENT 1 IN
VOLTAGE 2 IN
CURRENT 2 IN
COM-2
TB3
+
FREQ OUT
-
TB4
+12V
FREQ IN 1
FREQ IN 2
COM-3
TB5
D-IN 1
D-IN 2
D-IN 3
D-IN 4
D-IN 5
D-IN 6
COM-4
+24V
TB6
TB7
TB8
REV. A, UPDATE ANALOG INPUTS
DRAWN BY: BKP
DATE: 2/10/97
APPROVED BY:
DATE:
TOLERANCES: ± 2 DEC. PL. = .010" 3 DEC. PL. = .005"
CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063
TITLE: CONNECTION DIAGRAM, CORTEX SYSTEM CONTROLLER
SCALE:
DRAWING NUMBER: C11850
REV. A
SH. 1 OF 1



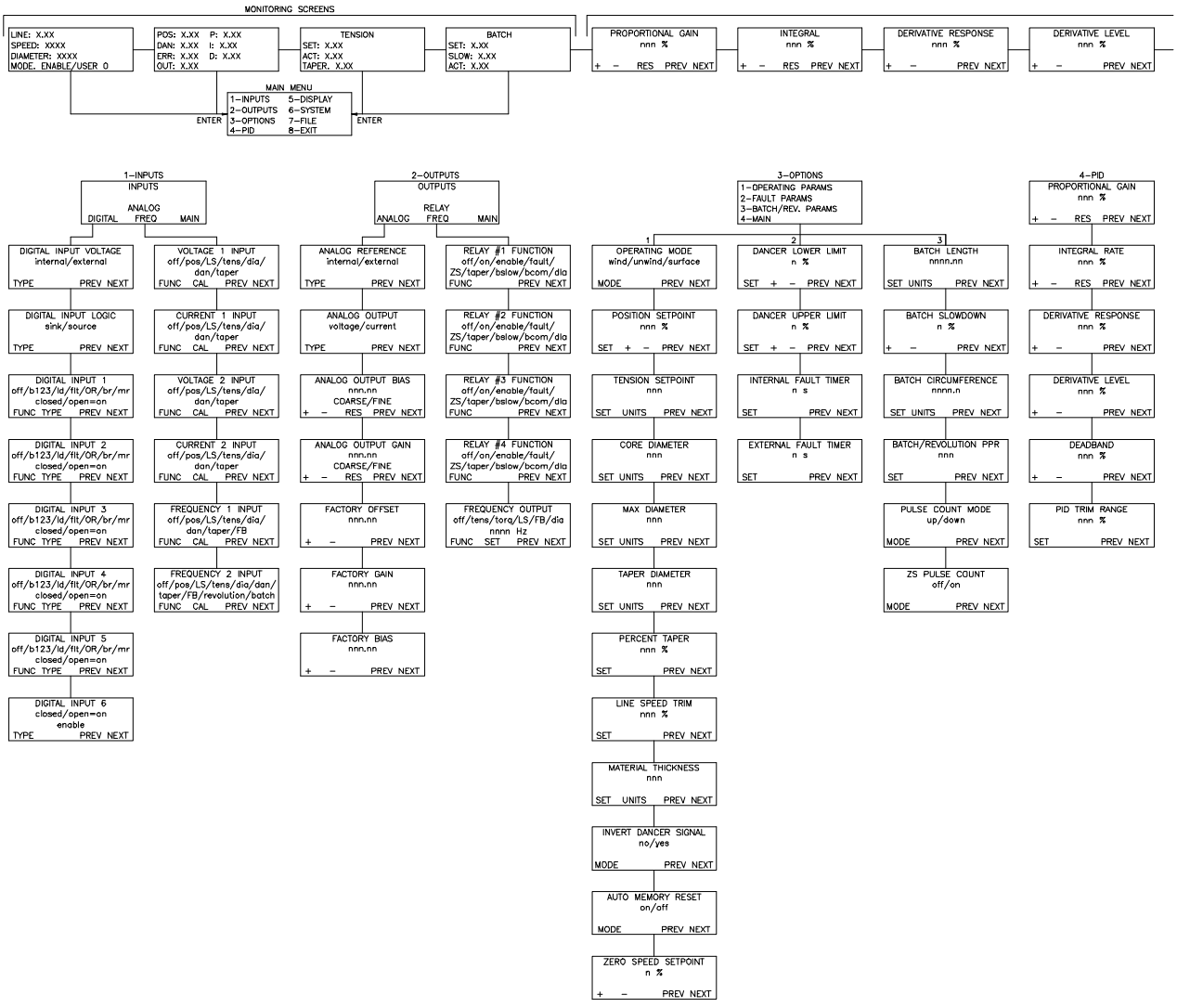
DRAWN BY: BKP	DATE: 9/8/97
APPROVED BY:	DATE:
TOLERANCES: ± 2 DEC. PL. = .010" 3 DEC. PL. = .005"	CAROTRON Driven by Excellence
SCALE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
	TITLE: CORTEX BLOCK DIAGRAM
DRAWING NUMBER: C11949	REV.- SH. 1 OF 1

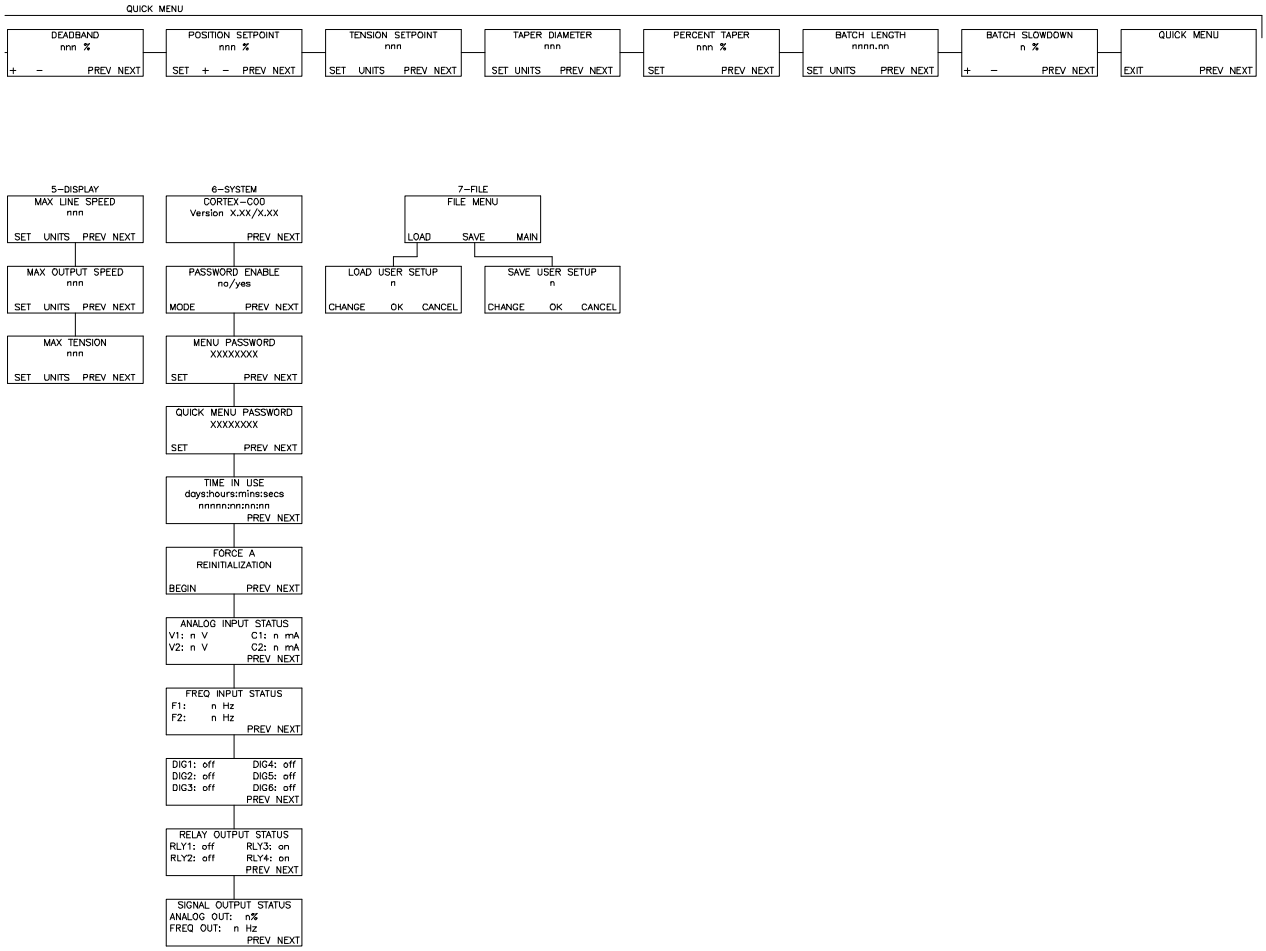
FACTORY PRESET CONFIGURATION



REV. A, 8-7-98, DIGITAL INPUTS TO SOURCING

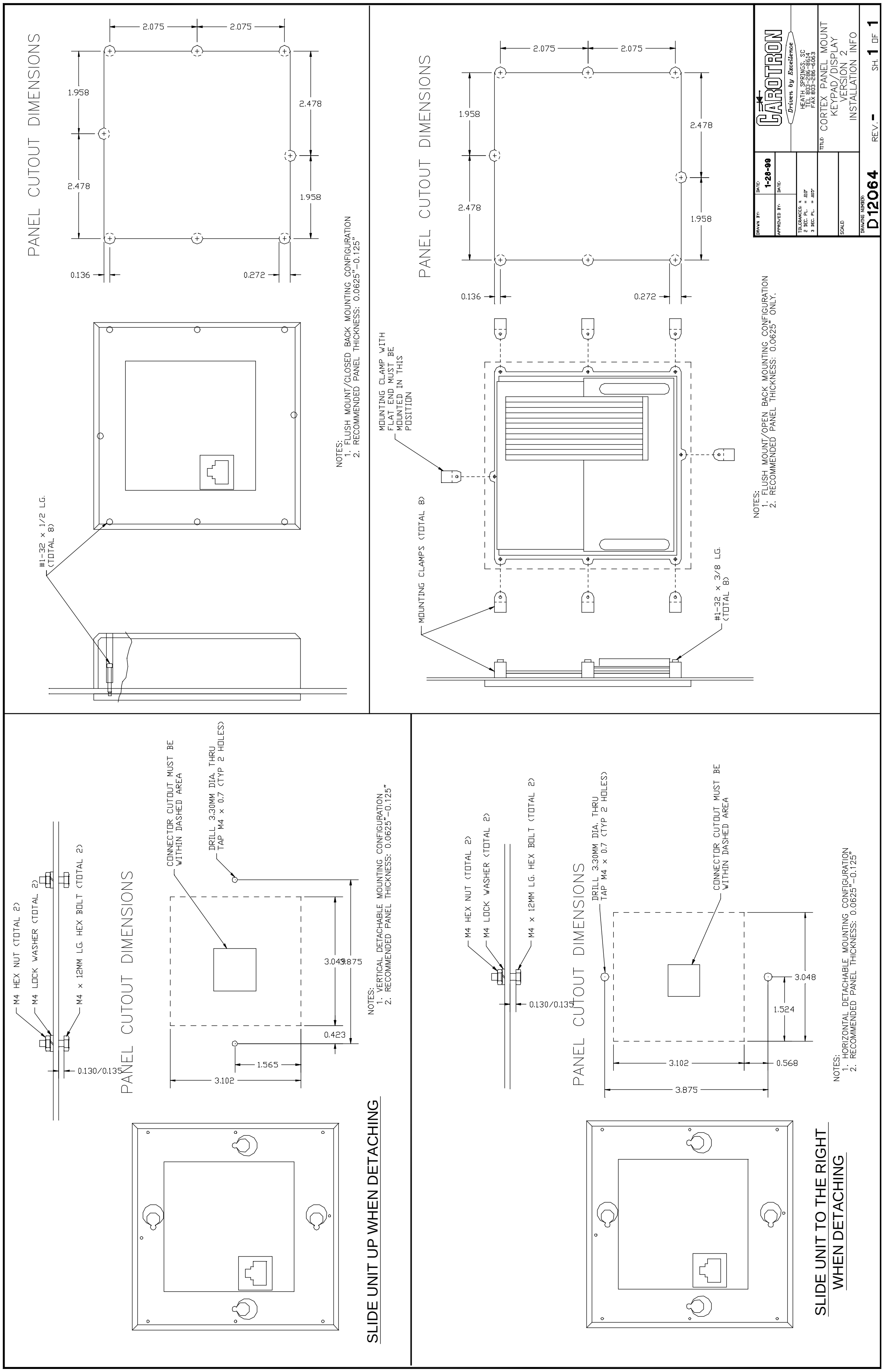
DRAWN BY: BKP	DATE: 9/10/97
APPROVED BY:	DATE:
TOLERANCES: 2 DEC. PL. = .010" 3 DEC. PL. = .005"	CAROTRON "Driven by Excellence" HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
SCALE:	TITLE: CORTEX DANCER POSITION CONNECTION DIAGRAM
DRAWING NUMBER: D11952	REV. A SH. 1 OF 1


MONITORING SCREENS
LINE: X.XX
SPEED: XXXX
DIAMETER: XXXX
MODE. ENABLE/USER 0
POS: X.XX P: X.XX
DAN: X.XX I: X.XX
ERR: X.XX D: X.XX
OUT: X.XX
TENSION
SET: X.XX
ACT: X.XX
TAPER. X.XX
BATCH
SET: X.XX
SLOW: X.XX
ACT: X.XX
PROPORTIONAL GAIN
nnn %
+ − RES PREV NEXT
INTEGRAL
nnn %
+ − RES PREV NEXT
DERIVATIVE RESPONSE
nnn %
+ − PREV NEXT
DERIVATIVE LEVEL
nnn %
+ − PREV NEXT
MAIN MENU
1−INPUTS 5−DISPLAY
2−OUTPUTS 6−SYSTEM
3−OPTIONS 7−FILE
4−PID 8−EXIT
ENTER
ENTER
1−INPUTS
INPUTS
ANALOG
DIGITAL FREQ MAIN
DIGITAL INPUT VOLTAGE
internal/external
TYPE PREV NEXT
DIGITAL INPUT LOGIC
sink/source
TYPE PREV NEXT
DIGITAL INPUT 1
off/b123/id/ilt/OR/br/mr
closed/open=on
FUNC TYPE PREV NEXT
DIGITAL INPUT 2
off/b123/id/ilt/OR/br/mr
closed/open=on
FUNC TYPE PREV NEXT
DIGITAL INPUT 3
off/b123/id/ilt/OR/br/mr
closed/open=on
FUNC TYPE PREV NEXT
DIGITAL INPUT 4
off/b123/id/ilt/OR/br/mr
closed/open=on
FUNC TYPE PREV NEXT
DIGITAL INPUT 5
off/b123/id/ilt/OR/br/mr
closed/open=on
FUNC TYPE PREV NEXT
DIGITAL INPUT 6
closed/open=on
enable
TYPE PREV NEXT
VOLTAGE 1 INPUT
off/pos/LS/tens/dia/
dan/taper
FUNC CAL PREV NEXT
CURRENT 1 INPUT
off/pos/LS/tens/dia/
dan/taper
FUNC CAL PREV NEXT
VOLTAGE 2 INPUT
off/pos/LS/tens/dia/
dan/taper
FUNC CAL PREV NEXT
CURRENT 2 INPUT
off/pos/LS/tens/dia/
dan/taper
FUNC CAL PREV NEXT
FREQUENCY 1 INPUT
off/pos/LS/tens/dia/
dan/taper/FB
FUNC CAL PREV NEXT
FREQUENCY 2 INPUT
off/pos/LS/tens/dia/dan/
taper/FB/revolution/batch
FUNC CAL PREV NEXT
2−OUTPUTS
OUTPUTS
RELAY
ANALOG FREQ MAIN
ANALOG REFERENCE
internal/external
TYPE PREV NEXT
ANALOG OUTPUT
voltage/current
TYPE PREV NEXT
ANALOG OUTPUT BIAS
nnn.nn
CDARSE/FINE
+ − RES PREV NEXT
ANALOG OUTPUT GAIN
nnn.nn
CDARSE/FINE
+ − RES PREV NEXT
FACTORY OFFSET
nnn.nn
+ − PREV NEXT
FACTORY GAIN
nnn.nn
+ − PREV NEXT
FACTORY BIAS
nnn.nn
+ − PREV NEXT
RELAY #1 FUNCTION
off/on/enable/fault/
ZS/taper/bslow/bcom/dia
FUNC PREV NEXT
RELAY #2 FUNCTION
off/on/enable/fault/
ZS/taper/bslow/bcom/dia
FUNC PREV NEXT
RELAY #3 FUNCTION
off/on/enable/fault/
ZS/taper/bslow/bcom/dia
FUNC PREV NEXT
RELAY #4 FUNCTION
off/on/enable/fault/
ZS/taper/bslow/bcom/dia
FUNC PREV NEXT
FREQUENCY OUTPUT
off/tens/torq/LS/FB/dia
nnnn Hz
FUNC SET PREV NEXT
3−OPTIONS
1−OPERATING PARAMS
2−FAULT PARAMS
3−BATCH/REV. PARAMS
4−MAIN
1
OPERATING MODE
wind/unwind/surface
MODE PREV NEXT
POSITION SETPOINT
nnn %
SET + − PREV NEXT
TENSION SETPOINT
nnn
SET UNITS PREV NEXT
CORE DIAMETER
nnn
SET UNITS PREV NEXT
MAX DIAMETER
nnn
SET UNITS PREV NEXT
TAPER DIAMETER
nnn
SET UNITS PREV NEXT
PERCENT TAPER
nnn %
SET PREV NEXT
LINE SPEED TRIM
nnn %
SET PREV NEXT
MATERIAL THICKNESS
nnn
SET UNITS PREV NEXT
INVERT DANCER SIGNAL
no/yes
MODE PREV NEXT
AUTO MEMORY RESET
on/off
MODE PREV NEXT
ZERO SPEED SETPOINT
n %
+ − PREV NEXT
2
DANCER LOWER LIMIT
n %
SET + − PREV NEXT
DANCER UPPER LIMIT
n %
SET + − PREV NEXT
INTERNAL FAULT TIMER
n s
SET PREV NEXT
EXTERNAL FAULT TIMER
n s
SET PREV NEXT
3
BATCH LENGTH
nnnn.nn
SET UNITS PREV NEXT
BATCH SLOWDOWN
n %
+ − PREV NEXT
BATCH CIRCUMFERENCE
nnnn.n
SET UNITS PREV NEXT
BATCH/REVOLUTION PPR
nnn
SET PREV NEXT
PULSE COUNT MODE
up/down
MODE PREV NEXT
ZS PULSE COUNT
off/on
MODE PREV NEXT
4−PID
PROPORTIONAL GAIN
nnn %
+ − RES PREV NEXT
INTEGRAL RATE
nnn %
+ − RES PREV NEXT
DERIVATIVE RESPONSE
nnn %
+ − PREV NEXT
DERIVATIVE LEVEL
nnn %
+ − PREV NEXT
DEADBAND
nnn %
+ − PREV NEXT
PID TRIM RANGE
nnn %
SET PREV NEXT



REV. H, VERSION 2.05 UPDATES, 6−14−01
REV. G, VERSION 2.04 UPDATES, 11−7−00
REV. F, ERROR REVISIONS, 9−3−99
REV. E, VERSION 2.02 UPDATES, 5−18−98
REV. D, VERSION 1.07 UPDATES, 2−24−98
REV. C, VERSION 1.05 UPDATES, 12−11−97
REV. B, VERSION 1.04 UPDATES, 11−17−97
REV. A, VERSION 1.03 UPDATES, 11−11−97

DRAWN BY: BKP	DATE: 2/11/97	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. = .010" 3 DEC. PL. = .005"		TITLE: CORTEX−C00 DANCER POSITION MENU STRUCTURE
SCALE:		
DRAWING NUMBER: D11924	REV. H	SH. 1 OF 1


PANEL CUTOUT DIMENSIONS
2.075
1.958
2.478
0.136
0.272
#1-32 x 1/2 LG. (TOTAL 8)
NOTES:
1. FLUSH MOUNT/CLOSED BACK MOUNTING CONFIGURATION
2. RECOMMENDED PANEL THICKNESS: 0.0625"-0.125"
MOUNTING CLAMP WITH FLAT END MUST BE MOUNTED IN THIS POSITION
MOUNTING CLAMPS (TOTAL 8)
#1-32 x 3/8 LG. (TOTAL 8)
NOTES:
1. FLUSH MOUNT/OPEN BACK MOUNTING CONFIGURATION
2. RECOMMENDED PANEL THICKNESS: 0.0625" ONLY.
CAROTRON
Driven by Excellence
HEATH SPRINGS, SC
TITLE: CORTEX PANEL MOUNT KEYPAD/DISPLAY VERSION 2 INSTALLATION INFO
DATE: 1-28-99
D12064
REV. -
SH. 1 OF 1
M4 HEX NUT (TOTAL 2)
M4 LOCK WASHER (TOTAL 2)
M4 x 12MM LG. HEX BOLT (TOTAL 2)
0.130/0.135
CONNECTOR CUTOUT MUST BE WITHIN DASHED AREA
DRILL 3.30MM DIA. THRU TAP M4 x 0.7 (TYP 2 HOLES)
3.048
3.875
0.423
1.565
3.102
1.524
0.568
NOTES:
1. VERTICAL DETACHABLE MOUNTING CONFIGURATION
2. RECOMMENDED PANEL THICKNESS: 0.0625"-0.125"
NOTES:
1. HORIZONTAL DETACHABLE MOUNTING CONFIGURATION
2. RECOMMENDED PANEL THICKNESS: 0.0625"-0.125"
SLIDE UNIT UP WHEN DETACHING
SLIDE UNIT TO THE RIGHT WHEN DETACHING

Parameter Quick Reference Table		
Parameter	Factory Preset	Customer Setting
Analog Output	Voltage	
Analog Output Bias	0	
Analog Output Gain	100 %	
Analog Reference	internal	
Auto Memory Reset	off	
Batch Length	100 feet	
Batch Slowdown	90%	
Batch Wheel Cir.	0"	
Batch/Rev PPR	1	
Core Diameter	1"	
Current 1 Input Func	off	
Current 1 Input Max	4095 bits	
Current 1 Input Min	0 bits	
Current 2 Input Func	off	
Current 2 Input Max	4095 bits	
Current 2 Input Min	0 bits	
Dancer Lower Limit	0 %	
Dancer Upper Limit	200 %	
Deadband	50 %	
Derivative Level	0 %	
Derivative Response	0 %	
Digital Input 1 Func	Bit 1	
Digital Input 1 Type	closed=on	
Digital Input 2 Func	Bit 2	
Digital Input 2 Type	closed=on	

Parameter	Factory Preset	Customer Setting
Digital Input 3 Func	Bit 3	
Digital Input 3 Type	closed=on	
Digital Input 4 Func	Load	
Digital Input 4 Type	closed=on	
Digital Input 5 Func	Memory Reset	
Digital Input 5 Type	closed=on	
Digital Input 6 Type	closed=on	
Digital Input Logic	sink	
Digital input Voltage	internal	
Ext. Fault Timer	0 s	
Factory Bias	49.80 % *	
Factory Gain	94.90 % *	
Factory Offset	49.80 % *	
Freq 1 Input Func	off	
Freq 1 Input Max	32,000 Hz	
Freq 1 Input Min	0 Hz	
Freq 2 Input Func	off	
Freq 2 Input Max	32,000 Hz	
Freq 2 Input Min	0 Hz	
Freq Out Func	off	
Freq Out Max	2000 Hz	
Integral Rate	33 %	
Int. Fault Timer	0 s	
Invert Dancer Signal	off	
Line Speed Trim	100%	
Material Thickness	0.005"	

Parameter	Factory Preset	Customer Setting
Max Diameter	10"	
Max Line Speed	100 Ft/Min	
Max Output Speed	1000 RPMs	
Max Tension	1 lb.	
Operating Mode	winder	
Password Enable	off	
Percent Taper	0 %	
PID Trim Range	100%	
Position Setpoint	50 %	
Proportional Gain	15 %	
Pulse Count Mode	Up	
Relay 1 Func	Enable	
Relay 2 Func	Fault	
Relay 3 Func	Zero Speed	
Relay 4 Func	off	
Taper Diameter	0"	
Tension Setpoint	0 %	
Voltage 1 Input Func	Line Speed	
Voltage 1 Input Max	4095 bits	
Voltage 1 Input Min	0 bits	
Voltage 2 Input Func	Dancer	
Voltage 2 Input Max	4095 bits	
Voltage 2 Input Min	0 bits	
Zero Speed Pulse Count	On	
Zero Speed Setpoint	5 %	

*The factory settings for the offset, bias, and gain parameters are unique for each Cortex unit. The actual values may differ slightly from the nominal values listed in the table.

3204 Rocky River Road
Heath Springs, SC 29058
Phone: (803) 286-8614
Fax: (803) 286-6063
MAN1033-1F
Issued 6-14-01