

MicroManager

CENTER REFERENCE GENERATOR

**Instruction Manual
MM3000-CRG**

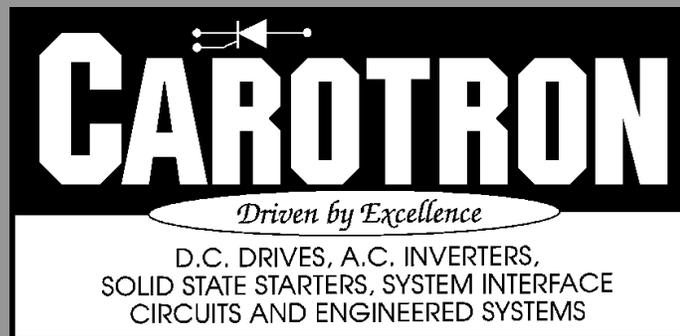


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1

General Description

The MicroManager 3000 series is a microprocessor based industrial system controller designed to handle a wide range of industrial applications. The simple user interface allows high level microprocessor control of an application but without the need of a computer for configuration.

Model MM3000-CRG (Center Reference Generator) is designed for velocity mode winding applications and for torque mode winding/unwinding applications.

In the velocity mode, the winder sets/controls the line speed. This is typically accomplished by using a potentiometer input to the MicroManager to set the desired line speed. The MicroManager calculates the required center driven take-up speed to maintain the desired line speed.

The MM3000-CRG can also be used on torque mode winders and unwinders (brake and driven). The CRG unit is ideal for use on applications that require more precise torque control than torque taper schemes, but less than full-featured CTCW (constant tension center wind) control methods.

2

Specifications

2.1 Electrical

A.C. Input Voltage Range - Single Phase

- 115 VAC \pm 10%, 50/60 Hz \pm 2 Hz
- Fused internally

Power Supply Output

- +12V regulated supply: 70mA max.

Digital Inputs (4 Total)

- Sinking or Sourcing Logic (selectable)
- V_{il} =+10.5 VDC min to +12.0 VDC max
- V_{ih} =0.0 VDC min to +8.5 VDC max

Analog Inputs (2 Total)

- 10 bit resolution (over-sampled to achieve 12 bit)
- Voltage Range: 0 to +12 VDC
- Input Impedance: 240k Ω

Frequency Inputs (1 Total)

- Sinking or Sourcing Logic (selectable)
- Frequency: 42kHz max, square wave
- Voltage: +12 VDC max
 - V_{il} =0.0 VDC min to +1.5 VDC max
 - V_{ih} =+2.5 VDC min to +12.0 VDC max

Digital Outputs (2 Total)

- Open collector (sinking output)
- 100ma max, 30VDC max

Analog Outputs (3 Total)

- Outputs 1 & 2:
 - 12 bits, voltage 0 to +10 VDC max,
 - or current 0 to +20 mADC max
- Output 3:
 - 10 bits, voltage only 0 to +5 VDC max

Communications

- Modbus RTU
- RS485 Multidrop (2 or 4 wire)

Temperature Range

- Chassis: 0-55°C

2.2 Physical

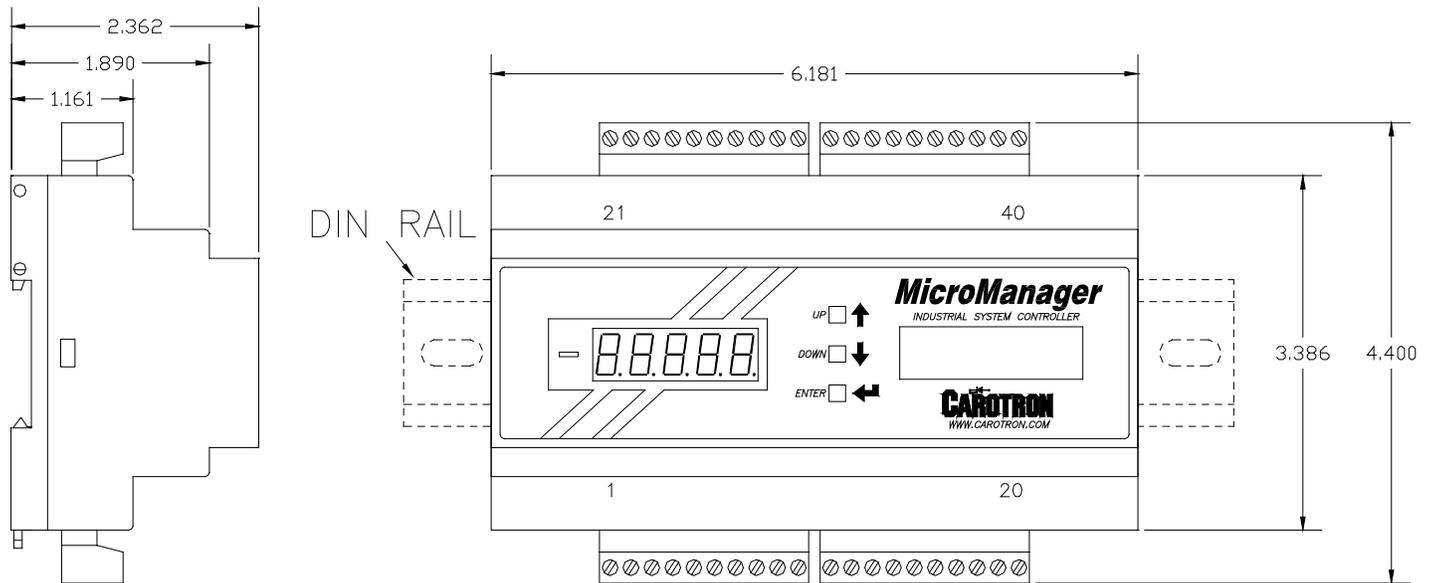


Figure 1: Physical Dimensions

3 Installation

3.1 Wiring Guidelines

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

Make no connections to ground other than at the designated terminal strip location.

Use fully insulated and shielded cable for all signal wiring. The shield should be connected to circuit common at one end only. The other end of the shield should be clipped and insulated to prevent the possibility of accidental grounding.

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

Any relay, contactor, starter, solenoid or other electro-mechanical device located in close proximity to or on the same line supply as the MicroManager should have a transient suppression device such as an MOV or R-C snubber connected in parallel with its coil. The suppressor should have short leads and be connected as close to the coil as possible.

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Terminal Connections

4.1 Signal Connections

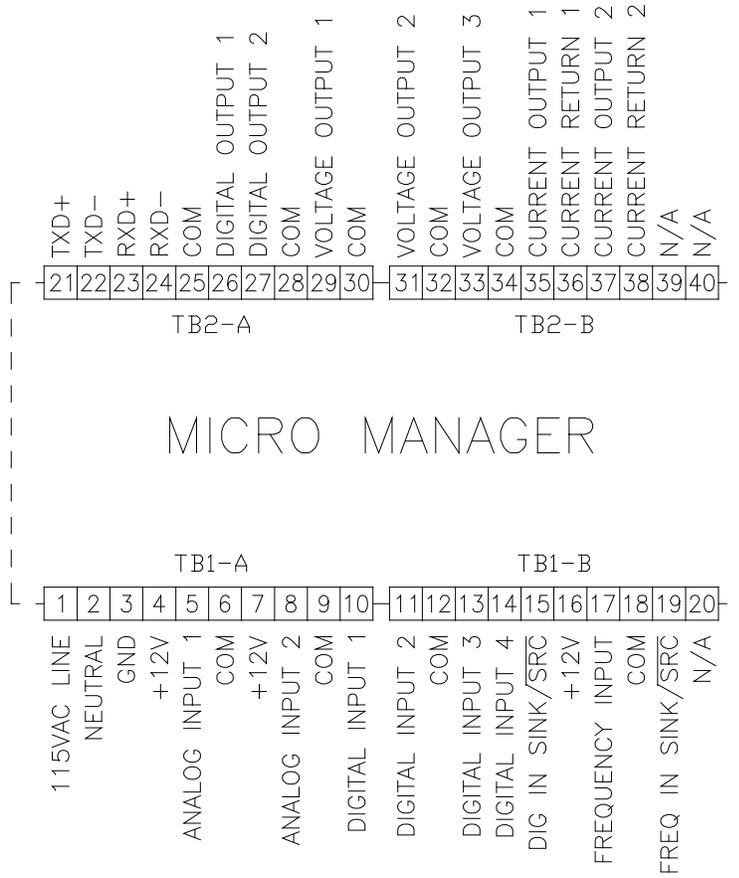


Figure 2: General Connections

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User Interface

Programming and adjustment of the MicroManager is accomplished via a three button interface and 5 seven segment LED displays. When power is first applied, all of the LED segments (including the negative sign) are momentarily lit. The display is then cleared and **CArottron** scrolls across the display. Next, the firmware revision is displayed as **r x.xx**. Lastly, **P1** is displayed indicating parameter 1.

Editing parameters is performed by using the Up and Down buttons to select the desired parameter. When the Enter button is pressed, the value of the selected parameter will be displayed. If the parameter type is Read/Write, the Up and Down buttons can be used to edit the value. If either the Up or Down button is pressed and held, the rate that the parameter value changes will continually increase, allowing large changes to be made quickly. Once the desired value has been displayed, press the Enter button to enter the new value. To escape the editing mode without applying changes, press both the Up and Down buttons simultaneously.

The value of Read Only parameters can be viewed as above, but the Up and Down buttons cannot be used to edit the value. If either button is pressed while a Read Only parameter is displayed, the display will flash **rEAd Only** to remind the user that this parameter cannot be edited.

There are some parameters whose values cannot be changed while the unit is in the Run mode. These parameters are listed as ICR, Inhibit **C**hange while **R**unning. Similar to above, if these parameter values are attempted to be edited while running, the display will flash **icr Loc'd** (icr locked) to inform the user that this parameter is an ICR type and that it cannot be edited, since the unit is currently in the Run mode.

In a typical setup, there will be a few Read/Write parameters whose values will be controlled by inputs, or by other parameters. The connections between these inputs or parameters is called a link. Thus, when a parameter value is being set or controlled by an input link or an internal link, the parameter cannot be edited manually. Similar to above, if an attempt is made to edit one of these parameters, the display will flash **Linc Loc'd Pxxx** (where xxx will be a number indicating the source of the link) to inform the user that a link has been made to this parameter.

Whenever parameter changes are made, they must be saved by setting P1 to 1. Otherwise, changes will be lost when power is cycled on the unit.

On power up, if an internal memory errors while loading the parameter values, the LED's will continually flash **EE Error**. Press and hold either the Up or Down button until the unit resets. If the EE Error persists, the internal memory has likely been corrupted. Press both the Up and Down buttons to force the unit to re-initialize using the factory defaults. This can be verified as the display will momentarily display **dFLTS USEd**. At this time, any parameter value changes must be re-entered.

6

Quick Start Procedure

For winders, the MicroManager can operate with a drive in either the velocity or torque mode. For unwinders, the MicroManager can operate with a brake or drive in the torque mode.

Determine the method of roll diameter calculation that will be used. The MicroManager provides four methods for obtaining the roll diameter. Below each method is described in detail. Note that Method 4 (Line Speed & Roll Speed) is valid only for torque mode. It therefore cannot be used on velocity mode winders.

Method 1: External Signal (Velocity or Torque Mode)

The simplest example of an external diameter signal is a rider arm and a potentiometer. In this method, one end of a rider arm lies on the roll. A pivot point at the other end is attached to a potentiometer. As the diameter changes, a proportional voltage signal is produced. Other examples are sonic and laser sensors that output a voltage signal proportional to diameter.

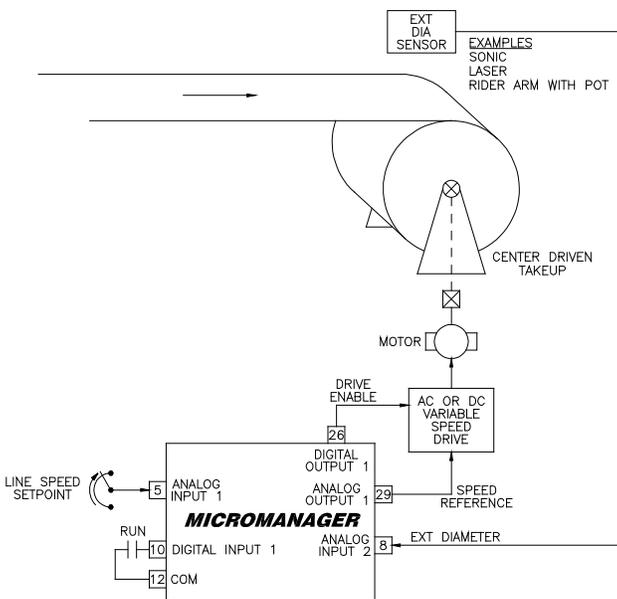


Figure 3: External Diameter (Velocity Mode)

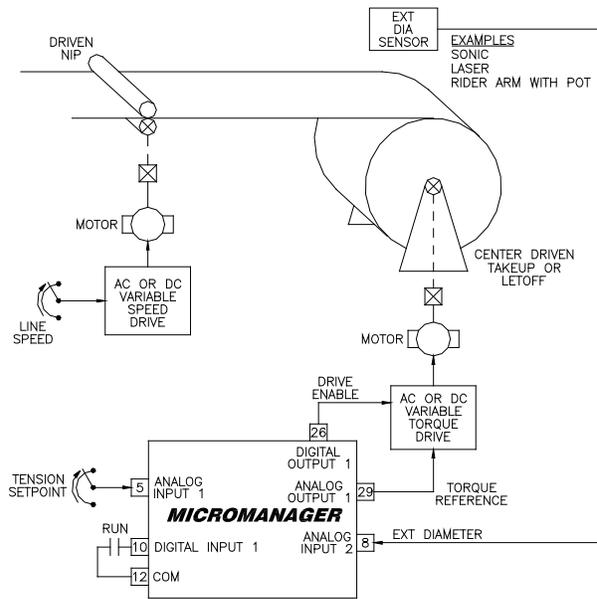


Figure 4: External Diameter (Torque Mode)

Method 2: Count Roll Revolutions (Velocity or Torque Mode)

The diameter can also be obtained by counting roll revolutions. For every one revolution of the roll, two material thicknesses are added (for winders) or subtracted (for unwinders) to the diameter. Roll revolutions may be obtained from an encoder mounted on the drive or brake, or simply from a proximity sensor and a bolt on the roll shaft.

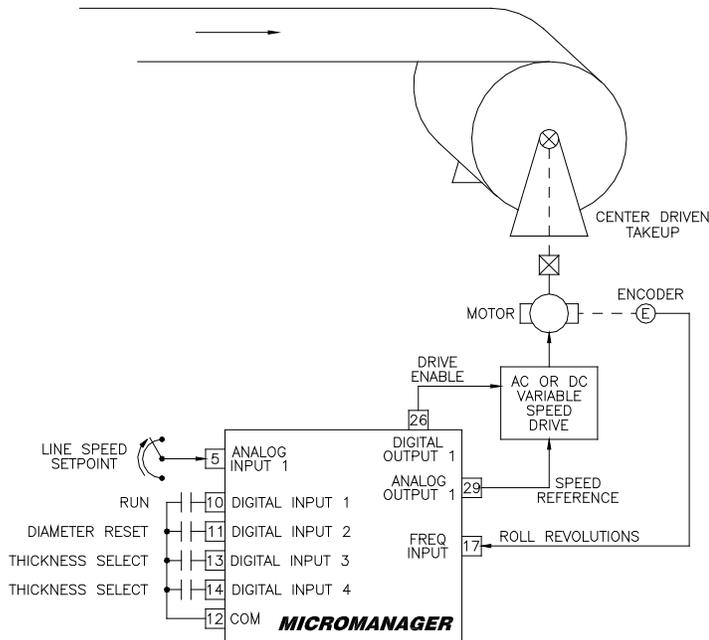


Figure 5: Roll Revolutions (Velocity Mode)

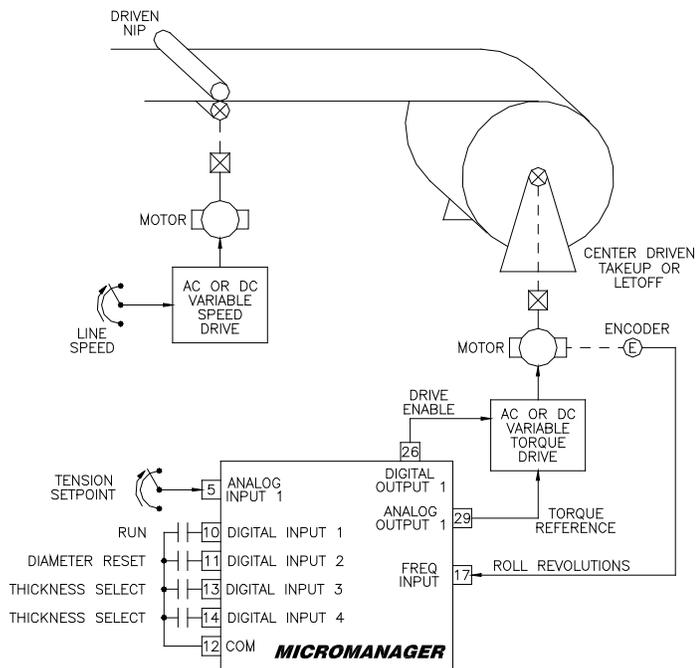


Figure 6: Roll Revolutions (Torque Mode)

Method 3: Count Line Revolutions (Velocity or Torque Mode)

Lastly, the diameter can also be obtained by counting the revolutions of a line roller in contact with the material. This basically measures the length of material wound onto or taken off of the roll. With this length, along with the material thickness, the diameter can be calculated. An encoder or proximity switch is typically used in conjunction with a roller wheel placed on the material to obtain the revolutions.

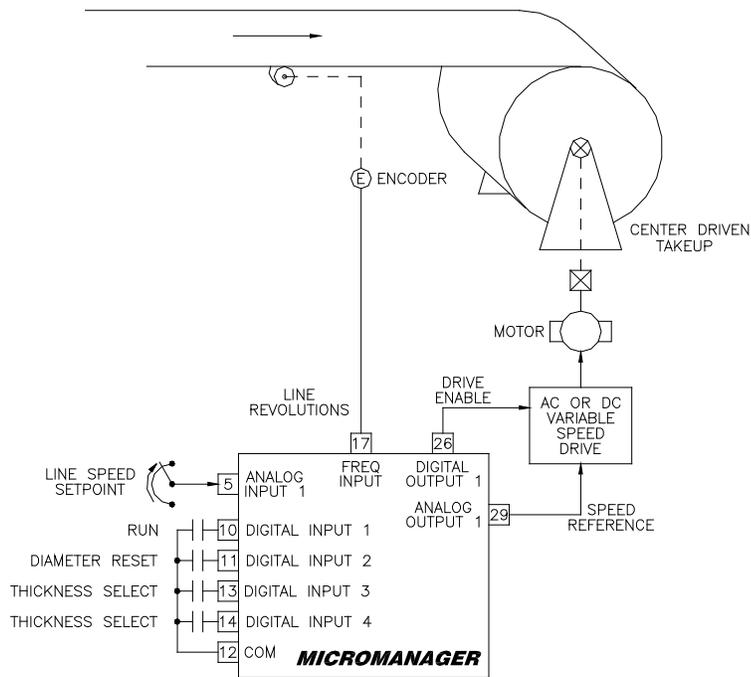


Figure 7: Line Revolutions (Velocity Mode)

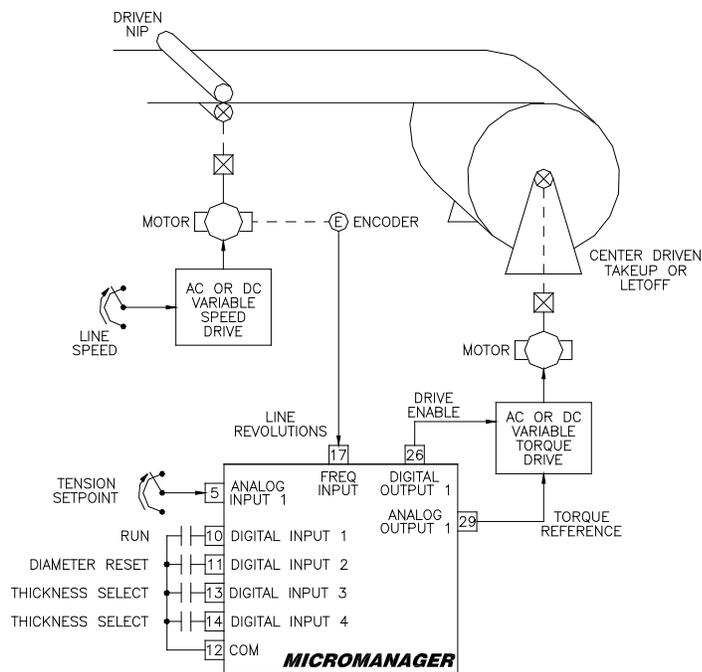


Figure 8: Line Revolutions (Torque Mode)

Method 4: Line Speed & Roll Speed (Torque Mode Only)

The diameter can be obtained by performing a calculation with the Line Speed and the Roll Speed signals. These two signals along with the Tension Setpoint must be connected to the MicroManager which has two analog inputs and one frequency input. Table 1 below lists the three possible methods to choose from. Note that Option C uses both analog inputs for the line and roll speed signals. Thus the Tension Setpoint will have to be an internal setting.

Method	Line Speed	Roll Speed	Tension Setpoint
A	Frequency	Analog	Analog
B	Analog	Frequency	Analog
C	Analog	Analog	Fixed Internal

Table 1: Line Speed & Roll Speed Subsets

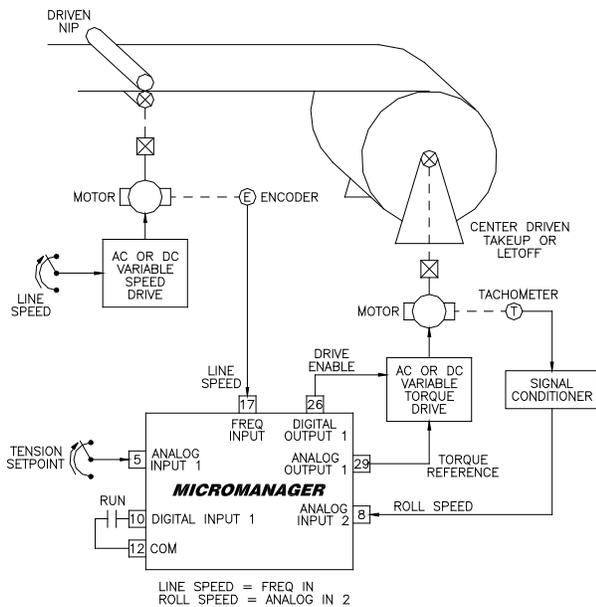


Figure 9: Line & Roll Speed [A] (Torque Mode)

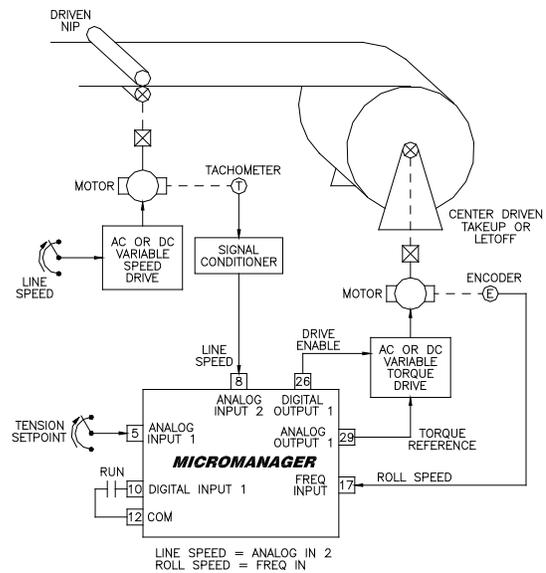


Figure 10: Line & Roll Speed [B] (Torque Mode)

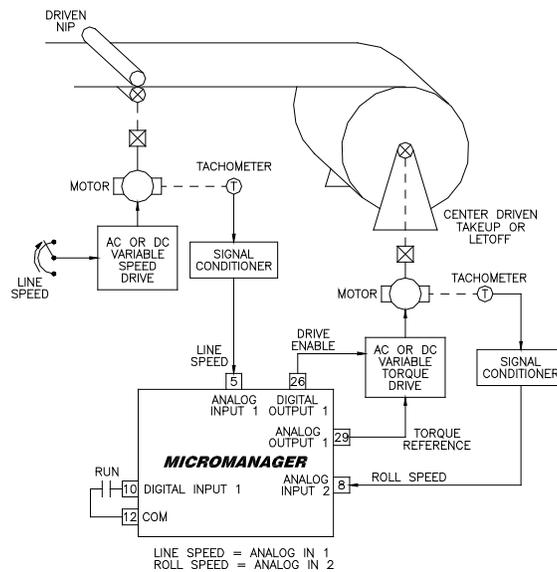


Figure 11: Line & Roll Speed [C] (Torque Mode)

Proceed to Section 6.1 below for velocity mode winders and to Section 6.2 on page 14 for torque mode winders or unwinders.

6.1 Velocity Mode Winder Calibration

In the velocity mode of operation, a potentiometer input on the MicroManager is typically used to set the desired line speed. The unit uses this setpoint along with a diameter measurement to calculate the required center driven winder speed.

Step 1

1. Make wiring connections using D13304 on page 46 based on the method of diameter calculation that will be used. Initially, all material must be **removed** from the machine for setup.

Diameter Method	P3
External	1
Count roll revolutions	2
Count line revolutions	3

Table 2: Velocity Mode Initialization Options

Step 2

1. Apply power and set P3 (Initialize) according to Table 2 above.
2. Set the following parameters according to your application:
 - P172 Accel Time in seconds
 - P173 Decel Time in seconds
 - P187 Core Diameter in user units
 - P188 Max Diameter in user units

Step 3

1. Perform the **Line Speed Potentiometer Calibration** on page 16.
2. Perform the appropriate diameter calibration step:
 - External Diameter Calibration** on page 17.
 - Roll Revolutions Diameter Calibration** on page 19.
 - Line Revolutions Diameter Calibration** on page 20.
3. If the Roll or Line Revolutions method is used above, perform the **Material Thickness Setup** on page 20 and temporarily activate the Diameter Reset (Digital Input 2).

Step 4

1. Perform the Analog Output 1 Calibration on page 20.
2. With an empty core loaded and the speed pot at minimum, close the run contact on Digital Input 1. Also, if necessary, start the winder drive. Slowly increase the speed pot to maximum.
3. Once at full speed, a hand tachometer may be used to scale the empty roll to the desired maximum line speed. The maximum speed can be decreased by lowering P114 (Analog Output 1 Gain) or by decreasing the winder drive's max speed adjustment. If the speed of the winder drive needs to be increased, use the drive's max speed adjustment. Increasing P114 beyond 100.00% should not be used for this purpose as the output signal will still be limited to 10V or 20mA.
4. Open the run contact to stop the machine. Load material. If either of the revolution methods of diameter calculation are used, select the appropriate material thickness via

Digital Inputs 3 & 4 and release the diameter reset (Digital Input 2) that was activated previously.

5. Adjust the speed pot to the desired level and then place the MicroManager into the run mode. The winder should begin ramping up to speed at a rate controlled by the Accel/Decel parameters. As the diameter increases, the winder speed should decrease to maintain a constant line speed throughout the entire build.
6. Set P1 to 1 to save parameters.
7. Document the parameter changes. Refer to Section 6.3.12 MicroManager Configuration Documentation on page 21.

6.2 Torque Mode Winder/Unwinder Calibration

In the torque mode of operation, a potentiometer input on the MicroManager is typically used to set the desired tension. The unit uses this setpoint along with a diameter measurement to calculate the required winder/unwinder torque.

Step 1

1. Make wiring connections using D13304 on page 47 based on the method of diameter calculation that will be used. Initially, all material must be **removed** from the machine for setup.

Diameter Method	P3
External	5
Count roll revolutions	6
Count line revolutions	7
Line Speed & Roll Speed: A	8
Line Speed & Roll Speed: B	9
Line Speed & Roll Speed: C	10

Table 3: Torque Mode Initialization Options

Step 2

1. Apply power and set P3 (Initialize) according to Table 3 above.
2. Set the following parameters according to your application:
 - P187 Core Diameter in user units
 - P188 Max Diameter in user units
 - P185 Roll Type (0=Winder, 1=Unwinder)

Step 3

1. Perform the **Tension Potentiometer Input Calibration** on page 16.
2. Perform the appropriate diameter calibration step:
 - External Diameter Calibration** on page 17.
 - Line Speed & Roll Speed (Subset A)** on page 17.
 - Line Speed & Roll Speed (Subset B)** on page 18.
 - Line Speed & Roll Speed (Subset C)** on page 19.
 - Roll Revolutions Diameter Calibration** on page 19.
 - Line Revolutions Diameter Calibration** on page 20.
3. If the Roll or Line Revolutions method is used above, perform the **Material Thickness Setup** on page 20 and temporarily activate the Diameter Reset (Digital Input 2).

Step 4

1. Perform the Analog Output 1 Calibration on page 20.
2. The maximum torque can be decreased by lowering P114 (Analog Output 1 Gain) or by decreasing the winder drive's max current adjustment. If the torque of the winder/unwinder drive needs to be increased, use the drive's max current adjustment. Increasing P114 beyond 100.00% should not be used for this purpose as the output signal will still be limited to 10V or 20mA.
3. Material can now be loaded onto the machine. Place the MicroManager in the Run mode by activating Digital Input 1. Adjust the tension pot to the desired level. Start the line drive.

4. For winders, as the diameter increases, the winder torque should increase proportionally to maintain a constant tension on the material throughout the entire build. For unwinders, as the diameter decreases, the winder torque should decrease proportionally to maintain a constant tension on the material throughout the entire build.
5. If taper tension is required, refer to Section 6.3.11 Taper Tension Adjustment on page 21.
6. Set P1 to 1 to save parameters.
7. Document the parameter changes. Refer to Section 6.3.12 MicroManager Configuration Documentation on page 21.

6.3 Calibration SubSteps

The following sections contain calibration steps that are common to both the velocity and torque mode calibration routines. These steps will be referenced from the above calibration routines.

6.3.1 Line Speed Potentiometer Input Calibration

A pot connected to Analog Input 1 sets the desired line speed. Typically, this input will not need calibrating, as the default values will provide satisfactory performance. If the calibration settings are in doubt or unknown, the input can be calibrated as follows.

Set P23 to 1 to initiate Analog Input 1 calibration. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Turn pot fully counter clockwise to provide for the minimum input signal and then press ENTER. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. Turn the pot fully clockwise to provide for the maximum input signal and press ENTER. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated.

The input can be verified by monitoring the value of P170. It should range from 0.00% (fully CCW) to 100.00% (fully CW).

6.3.2 Tension Potentiometer Input Calibration

A pot connected to Analog Input 1 sets the desired tension. Typically, this input will not need calibrating, as the default values will provide satisfactory performance. If the calibration settings are in doubt or unknown, the input can be calibrated as follows.

Set P23 to 1 to initiate Analog Input 1 calibration. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Turn pot fully counter clockwise to provide for the minimum input signal and then press ENTER. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. Turn the pot fully clockwise to provide for the maximum input signal and press ENTER. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated.

The input can be verified by monitoring the value of P203. It should range from 0.00% (fully CCW) to 100.00% (fully CW).

6.3.3 External Diameter Calibration

If an external sensor is used to provide a diameter signal to the MicroManager, it will need to be calibrated and wired to Analog Input 2. If multiple core sizes are to be used, calibrate the sensor using the smallest core. Likewise, calibration should also be performed with the largest diameter roll. A typical setup would provide a 0V signal when the diameter is at core (empty roll), and 10-12VDC when the diameter is at maximum.

Start the Analog Input 2 calibration by setting P24 to 1. Actuate the diameter sensor so it provides the minimum signal to the MicroManager. (Please note that the minimum signal may not always correspond to core diameter. In some setups, the minimum signal may be produced when the diameter is at maximum.) Press ENTER to calibrate the low input. Actuate the diameter sensor so that it provides the maximum signal to the MicroManager. Press ENTER to calibrate the high input. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated.

Determine the logic of the diameter signal. Analog input 2 expects the diameter signal to be scaled so that the minimum level corresponds to any empty core and the maximum level corresponds to full roll. With this type of signal, set P30 (Bias) to 0.00% and P32 (Gain) to 100.00%. If an inverted diameter signal is used (min signal at max diameter, max signal at core diameter), set P30 (Bias) to 100.00% and P32 (Gain) to 0.00%.

The input can be verified by monitoring the value of P191. It should range from 0.00% (at core) to 100.00% (at max diameter). Additionally, P202 (Diameter) should range from the Core Diameter to the Max Diameter. A simple and easy method to verify the diameter measurement is to physically place a second empty core onto the loaded empty core. This will fool the diameter sensor into thinking that the diameter has increased by a factor of 3. Thus, the P202 (Diameter) value should be 3 times P187 (Core Diameter).

6.3.4 Line Speed & Roll Speed Diameter Calibration (A)

In this mode, the line speed is typically generated by an encoder or by a frequency output signal on the line drive. Place the line drive in the run mode but with zero reference. Initiate the Freq. Input calibration by setting P68 to 1. The display will momentarily show LoCAL, and then display the incoming frequency level in Hertz. Since the line is not running, a value of 0 should currently be displayed. Press the ENTER button to calibrate the low input. The display will momentarily show HiCAL, and again display the incoming frequency level. Increase the line speed to maximum. Once the line has accelerated to its maximum speed, it is recommended that a hand tachometer be used to verify and note the surface speed (i.e., in Yards/Min, Meters/Min, etc...). This value will be needed in the following step. The display value should reflect the incoming frequency level. Press ENTER to calibrate the high input. The line drive may now be stopped.

If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P170. It should range from 0.00% when the line is stopped to 100.00% at maximum speed.

The roll speed can be generated by a tachometer or by an analog output from the roll drive. In order to calibrate the roll speed signal, an empty core must be driven at the speed level

that was measured above. Since the winder/unwinder drive will normally be operating in the torque mode, it must temporarily be switched to the velocity mode for this calibration step.

Once in velocity mode, run the winder/unwinder drive with zero reference. Initiate the Analog Input 2 calibration by setting P24 to 1. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Press ENTER to record the low input. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. While monitoring the hand tachometer, adjust the roll speed until the empty core matches the maximum line speed value recorded above. Press ENTER to record the high value. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P192. It should range from 0.00% when the roll is stopped to 100.00% at the matched speed.

The winder/unwinder drive may now be stopped and returned to the torque mode.

6.3.5 Line Speed & Roll Speed Diameter Calibration (B)

In this mode, the line speed is typically generated by a tachometer or by an analog output from the line drive. Place the line drive in the run mode but with zero reference. Initiate Analog Input 2 calibration by setting P24 to 1. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Press the ENTER button to calibrate the low input. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. Increase the line speed to maximum. Once the line has accelerated to its maximum speed, it is recommended that a hand tachometer be used to verify and note the surface speed (i.e., in Yards/Min, Meters/Min, etc...). This value will be needed in the following step. Press ENTER to calibrate the high input. The line drive may now be stopped.

If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P170. It should range from 0.00% when the line is stopped to 100.00% at maximum speed.

The roll speed can be generated by an encoder or by a frequency output from the roll drive. In order to calibrate the roll speed signal, an empty core must be driven at the speed level that was measured above. Since the winder/unwinder drive will normally be operating in the torque mode, it must temporarily be switched to the velocity mode for this calibration step.

Once in velocity mode, run the winder/unwinder drive with zero reference. Initiate the Frequency Input calibration by setting P68 to 1. The display will momentarily show LoCAL, and then display the incoming frequency level in Hertz. Press ENTER to record the low input. The display will momentarily show HiCAL, and again display the incoming frequency input level. While monitoring the hand tachometer, adjust the roll speed until the empty core matches the maximum line speed value recorded above. Press ENTER to record the high value. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P192. It should range from 0.00% when the roll is stopped to 100.00% at the matched speed. The winder/unwinder drive may now be stopped and returned to the torque mode.

6.3.6 Line Speed & Roll Speed Diameter Calibration (C)

In this mode, the line speed is typically generated by a tachometer or by an analog output from the line drive. Place the line drive in the run mode but with zero reference. Initiate Analog Input 1 calibration by setting P23 to 1. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Press the ENTER button to calibrate the low input. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. Increase the line speed to maximum. Once the line has accelerated to its maximum speed, it is recommended that a hand tachometer be used to verify and note the surface speed (i.e., in Yards/Min, Meters/Min, etc...). This value will be needed in the following step. Press ENTER to calibrate the high input. The line drive may now be stopped.

If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P170. It should range from 0.00% when the line is stopped to 100.00% at maximum speed.

The roll speed can be generated by a tachometer or by an analog output from the winder drive. In order to calibrate the roll speed signal, an empty core must be driven at the speed level that was measured above. Since the winder/unwinder drive will normally be operating in the torque mode, it must temporarily be switched to the velocity mode for this calibration step.

Once in velocity mode, run the winder/unwinder drive with zero reference. Initiate the Analog Input 2 calibration by setting P24 to 1. The display will momentarily show LoCAL, and then display the analog-to-digital conversion bit value. Press ENTER to record the low input. The display will momentarily show HiCAL, and again display the analog-to-digital conversion bit value. While monitoring the hand tachometer, adjust the roll speed until the empty core matches the maximum line speed value recorded above. Press ENTER to record the high value. If an error occurred (i.e., min value > max value), CAL Error will be displayed and the calibration must be repeated. The input can be verified by monitoring the value of P192. It should range from 0.00% when the roll is stopped to 100.00% at the matched speed.

The winder/unwinder drive may now be stopped and returned to the torque mode.

6.3.7 Roll Revolutions Diameter Calibration

In this method of diameter calculation, the MicroManager counts the incoming pulses on the Freq. Input to determine the number of roll revolutions. The revolution count along with the material thickness is used to calculate the diameter. The pulse train is typically generated by an encoder or a proximity switch that is mounted to the motor or to the roll shaft.

Set P76 to the number of pulses that will be generated in one revolution of the roll shaft. Note that if gearing is used between the motor and roll shaft, and the pulse generator is located on the motor side, the number of pulses generated will be affected by this gearing. The setup can be verified by monitoring P74 (Freq. Input Count). When the MicroManager is in the Run mode and the Diameter Reset input is off, every pulse on the Freq. input will cause P74 to increase by one. Likewise, P189 (Revolutions) may also be checked. For

every one revolution of the winder roll, this value should increase by one.

6.3.8 Line Revolutions Diameter Calibration

This method is similar to the Roll Revolutions method above. The pulse train is typically generated by an encoder or a proximity switch. However, in this case, the pulse generator is not attached to the roll but to a line shaft or to a wheel that is in contact with the material. The revolution count, material thickness, and line roll circumference are used to calculate the diameter.

Set P76 to the number of pulses that will be generated in one revolution of the line shaft or wheel. Set P190 to the circumference of the line shaft/wheel that is in contact with the material.

The setup can be verified by monitoring P74 (Freq. Input Count). When the MicroManager is in the Run mode and the Diameter Reset input is off, every pulse on the Freq. input will cause P74 to increase by one. Likewise, P189 (Revolutions) may also be checked. For every one revolution of the line shaft/wheel, this value should increase by one.

6.3.9 Material Thickness Setup

The MicroManager provides four locations (P196-P199) to store commonly used material thicknesses. Each of the four values can be selected for use by the Diameter Calculator by Digital Inputs 3 & 4 (See table below).

Digital Input 3	Digital Input 4	Thickness Used
OFF	OFF	P196
OFF	ON	P197
ON	OFF	P198
ON	ON	P199

Table 4: Thickness Select

Set P196-P199 to the material thickness that will be used.

6.3.10 Analog Output 1 Calibration

By default, the MicroManager will provide a 0 to 10VDC (or 0-20mA) output signal. The following steps can be used to modify the calibration levels. Warning! The steps below will force an output level even though the unit may be in the stop mode. Ensure that any connected devices are in a safe mode (i.e., will ignore any signal output from the MicroManager).

1. Ensure that the MicroManager is in the stop mode.
2. Adjust P117 (Analog Output 1 Bias) to set the desired minimum output level. When adjusting P117, the new value must be entered for it to take effect.
3. Initially, set P114 (Analog Output 1 Gain) to 0.00%.
4. Set P126 (Analog Output 1 Force) to 1 to force the output to full scale.

5. Increase P114 (Analog Output 1 Gain) until the desired level is reached. When adjusting P114, the new value must entered for it to take affect.
 6. **Set P126 back to 0!**
-

6.3.11 Taper Tension Adjustment

With winders, many times it is necessary to build tight packages with constant tension near the core and then taper (or decrease) the tension on the outer layers of the roll to prevent wrinkling and/or telescoping. The MicroManager CRG model can provide taper tension when using one of the torque mode control methods.

1. Monitor the roll as it is being built and make note of the diameter level at which constant tension problems begin to occur.
 2. Set P204 (Taper Diameter) so that the tension will begin tapering at a level prior to the problem area observed in the previous step.
 3. Set P205 (Taper Percentage) to control how much tension is reduced. Wind another roll and make adjustments to P204 and P205 as necessary.
-

6.3.12 MicroManager Configuration Documentation

It is recommended that, once setup is complete, the configuration of the MicroManager be documented. This can be done on a PC with the MicroManager software (available online at www.carotron.com) or manually by following the procedure below.

Set P14 (List Modified Parameters) to 1. The display will show a list of all the parameters whose value has been modified from the factory preset. The Up and Down buttons are used to scroll through the list. Once the changed parameters have been documented, press the Enter button to exit.

Next, display the value of each of the modified parameters that were listed above. Table 12 on page 40 provides a User column where the parameter values may be noted.

7

Programming & Adjustments

The MicroManager's parameters are grouped into numerous functional blocks. The blocks can be interconnected via links in different configurations to perform different application tasks. Please refer to drawing D13306 Sheet 1 on page 48 for an overall view of all the blocks. Each parameter has a descriptive name and a tag (or number) identifier. The following sections contain each software block diagram and descriptions of each parameter function. Refer to Figure 12 below for key conventions that are used in the block diagrams. Each parameter is one of three types: Read-Only (RO), Inhibit Change while Running (ICR), or Read-Write (RW). ICR parameters can be changed only when the unit is not in the Run mode. Remember that parameter changes must be saved by setting P1 to 1.

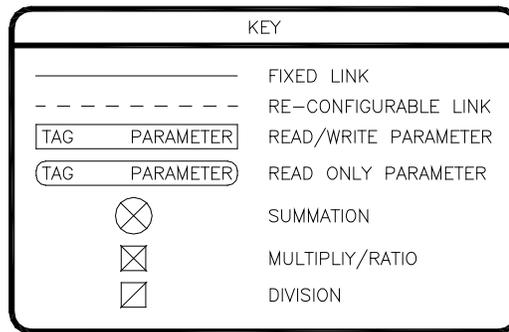


Figure 12: Block Diagram Key

7.1 Analog Inputs

The MicroManager has two configurable analog (voltage) inputs. Each input can be configured to write to any Read/Write parameter.

Destination (15-16, ICR, default: 0)

The tag of the target parameter that the analog input will control.

Status (17-18, Read Only)

The 12 bit analog-to-digital conversion (ADC) value.

Input Voltage	Status
12.0	4092
9.0	3069
6.0	2046
3.0	1023
0.0	0

Table 5: Analog Input Status Readings

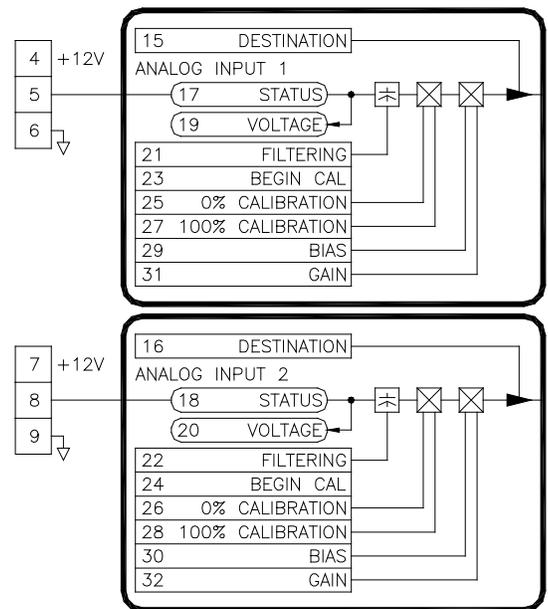


Figure 13: Analog Inputs

Voltage (19-20, Read Only)

The voltage level on the analog input.

Filtering (21-22, Read/Write, default: 0)

An averaging filter can be applied to the incoming signal to reduce the effects of noise. Increasing the value increases the filtering.

Begin Calibration (23-24, ICR, default: 0)

For proper measurement, the analog input must be calibrated to the range of the incoming signal. Calibration is performed by setting the **0% Calibration** and **100% Calibration** parameters. This can be done manually (see below) or by allowing the MicroManager to measure the levels.

Calibration is started by setting this parameter to 1. After the Enter button is pressed, the display will momentarily display LoCAL (Low Calibration). The display will then change showing the ADC value. The minimum signal should be applied to the input. When the Enter button is pressed, the ADC value will be recorded.

The display will then momentarily display HiCal (High Calibration) and then show the ADC value. The maximum signal should be applied to the input. When the Enter button is pressed, the ADC value will be recorded.

If the low calibration value is less than the high calibration value, the low and high value will be stored in the **0% Calibration** and **100% Calibration** parameters. Otherwise, the display will show CAL Error and the calibration values will be discarded and the routine will need to be repeated.

0% Calibration (25-26, Read/Write, default: 0)

This calibration value defines the minimum input signal. This value corresponds to the 12 bit ADC value when the analog input is at its minimum level. For proper operation, the **0% Calibration** value must be less than the **100% Calibration** value. Use the following formula to set the value manually.

$$0\% \text{ Calibration} = \frac{\text{Minimum Input Voltage}}{12\text{V}} \times 4092$$

100% Calibration (27-28, Read/Write, default: 4092)

This calibration value defines the maximum input signal. This value corresponds to the 12 bit ADC value when the analog input is at its maximum level. For proper operation, the **100% Calibration** value must be greater than the **0% Calibration** value. Use the following formula to set the value manually.

$$100\% \text{ Calibration} = \frac{\text{Maximum Input Voltage}}{12\text{V}} \times 4092$$

Bias (29-30, Read/Write, default: 0.00%)

This parameter defines the value sent to the target parameter when the input signal is at or below 0%.

Gain (31-32, Read/Write, default: 100.00%)

This parameter defines the value sent to the target parameter when the input signal is at or above 100%.

7.2 Digital Inputs

The MicroManager has four configurable digital inputs. Each input can write one of two values to any Read/Write parameter. Terminal 15 is used to select Sinking or Sourcing logic. Refer to D13304 on page 46 for more details.

Destination (41-44, ICR, default: 0)

The tag of the target parameter that the digital input will control.

Status (53-56, Read Only)

The state of the digital input, open or closed.

Open Value (45-48, Read/Write, default: 0)

The value in this parameter is sent to the target parameter when the digital input is open (off).

Closed Value (49-52, Read/Write, default: 1)

The value in this parameter is sent to the target parameter when the digital input is closed (on).

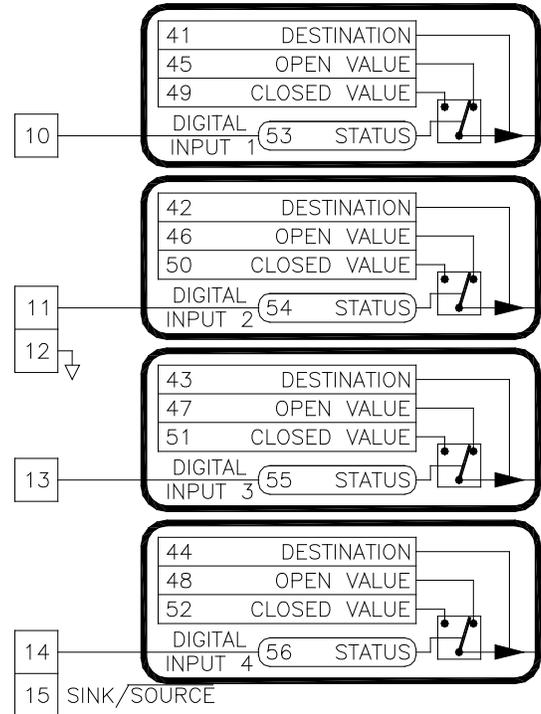


Figure 14: Digital Inputs

7.3 Frequency Input

The MicroManager has one configurable frequency input. It can be configured to write to any Read/Write parameter. Additionally, this input can simultaneously function as a pulse or revolution counter. Terminal 19 is used to select Sinking or Sourcing logic for the frequency input. Refer to D13304 on page 46 for more details.

Destination (65, ICR, default: 0)

The tag of the target parameter that the frequency input will control.

Status (66, Read Only)

The level of the input signal in Hertz.

Filtering (67, Read/Write, default: 0)

An averaging filter can be applied to the incoming signal to reduce the effects of noise. Increasing the value increases the filtering.

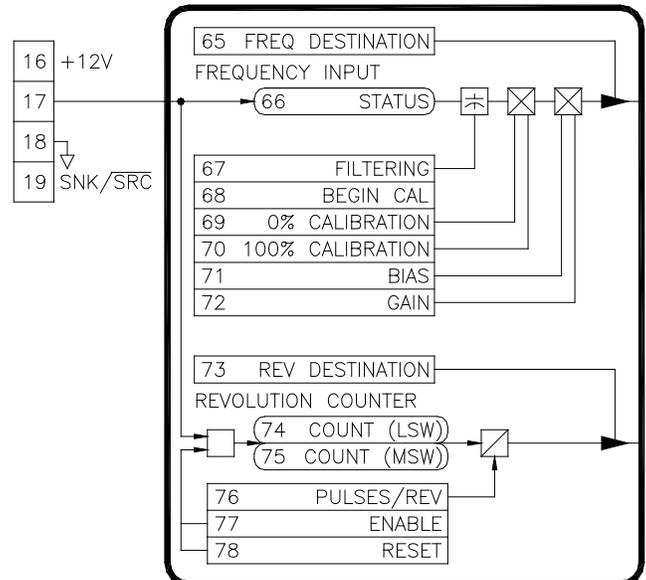


Figure 15: Freq. Input

Begin Calibration (68, ICR, default: 0)

For proper measurement, the frequency input must be calibrated to the range of the incoming signal. Calibration is performed by setting the **0% Calibration** and **100% Calibration** parameters. This can be done manually (see below) or by allowing the MicroManager to measure the levels.

Calibration is started by setting this parameter to 1. After the Enter button is pressed, the display will momentarily display LoCAL (Low Calibration). The display will then change showing the frequency value in Hertz. The minimum signal should be applied to the input. When the Enter button is pressed, the frequency value will be recorded.

The display will then momentarily display HiCal (High Calibration) and then show the frequency value. The maximum signal should be applied to the input. When the Enter button is pressed, the frequency value will be recorded.

If the low calibration value is less than the high calibration value, the low and high value will be stored in the **0% Calibration** and **100% Calibration** parameters. Otherwise, the display will show CAL Error and the calibration values will be discarded and the routine will need to be repeated.

0% Calibration (69, Read/Write, default: 0)

This calibration value defines the minimum input signal in Hertz. This value corresponds to the frequency level when the input is at its minimum level. For proper operation, the **0% Calibration** value must be less than the **100% Calibration** value.

100% Calibration (70, Read/Write, default: 50000)

This calibration value defines the maximum input signal in Hertz. This value corresponds to the frequency level when the input is at its maximum level. For proper operation, the **100% Calibration** value must be greater than the **0% Calibration** value.

Bias (71, Read/Write, default: 0.00%)

This parameter defines the value sent to the target parameter when the input signal is at or below 0%.

Gain (72, Read/Write, default: 100.00%)

This parameter defines the value sent to the target parameter when the input signal is at or above 100%.

Revolution Destination (73, ICR, default: 0)

The tag of the target parameter that the revolution counter will control.

Count (74-75, Read Only)

The value of the pulse counter. When **Count Enable** is 1, every rising edge on the input signal causes the value to increase by 1. In order to accommodate for high resolution encoders, the value is a 32 bit integer and thus has a most significant (upper) 16 bits, and a least significant (lower) 16 bits. The counter has an upper limit of 4,294,967,295.

Pulses Per Revolution (76, Read/Write, default: 1)

This parameter is divided into the **Count** value to produce a revolution count. For example, if a 1024 line encoder is connected and this parameter is set to 1024, then the target parameter will increment once for each full revolution of the encoder.

Reset (78, Read/Write, default: 0)

When this parameter is 1, it resets **Count** to zero.

7.4 HMI

The HMI block provides for diagnostic monitoring of the buttons over the communications port. A status of zero indicates the button is not pressed. A status of 1 indicates the button is pressed.

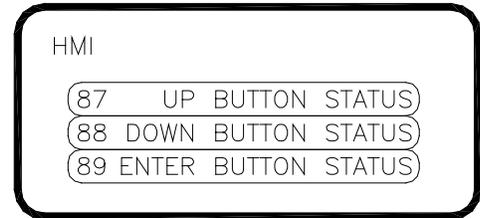


Figure 16: HMI

7.5 Communications

The MicroManager is equipped with a Modbus RTU RS485 slave port. The port can operate in 2 or 4 wire mode. Refer to D13307 on page 56 for connection information.

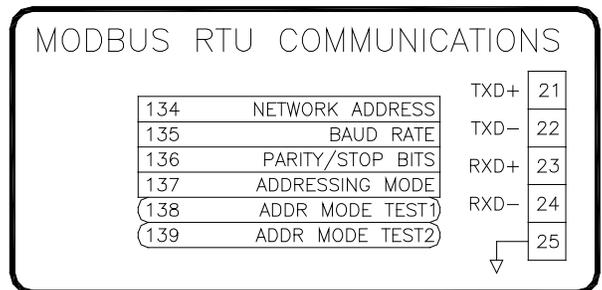


Figure 17: Communications

Network Address (134, Read/Write, default: 1)

The address of the MicroManager on the Modbus network. Each device on the bus must have a unique network address.

Baud Rate (135, Read/Write, default: 4)

Sets the transmit and receive rate of data over the serial port.

Setting	Baud
0	2400
1	4800
2	9600
3	19200
4	38400

Table 6: Baud Rate Settings

Parity/Stop Bits (136, Read/Write, default: 1)

Sets the parity and number of stop bits for the serial port.

Setting	Parity, Stop Bits
0	None,1
1	None,2
2	Even,1
3	Odd,1

Table 7: Parity Stop Bits Settings

Addressing Mode (137, Read/Write, default: 1)

In the Modbus specification, registers are addressed using an offset. For example, to read register 1, an address of 0 must be used. Much of the available Modbus master communications equipment (PLC's and touchscreens) take this offset into account. Therefore, to read register 1, an address of 1 is used when programming. The master device will decrement the address before requesting it from the slave.

However, not all master devices take this offset into account. The **Addressing Mode** parameter can be used to implement either scheme and "match up" the addresses so that the actual address is used to address that register (making programming much easier).

In order to determine which mode to use with a particular master, have the master read the **Address Mode Test 2** parameter. If the returned value is 0xAAAA in hex, everything is correct. If the returned value is 0x5555 (the value of **Address Mode Test 1**), then the **Addressing Mode** parameter needs to be changed.

Addressing Mode Test 1 (138, Read Only)

Test parameter that has a fixed value of 21845 (5555 in hex) .

Addressing Mode Test 2 (139, Read Only)

Test parameter that has a fixed value of 43690 (AAAA in hex) .

7.6 Digital Outputs

The MicroManager has two configurable open collector (sinking) type digital outputs.

Source (90-91, ICR, default: 0)

The tag of the parameter that will control the digital output.

On Threshold (92-93, Read/Write, default: 0.01%)

The level that the source parameter must equal or exceed in order for the digital output to be on.

Off Threshold (94-95, Read/Write, default: 0.00%)

The level that the source parameter must be equal to or fall below in order for the digital output to be off.

Invert (96-97, Read/Write, default: 0.01%)

When this parameter is 1, the logic of the digital output is inverted.

Status (98-99, Read Only)

The state of the digital output. A zero indicates Off, and a 1 indicates On (sinking).

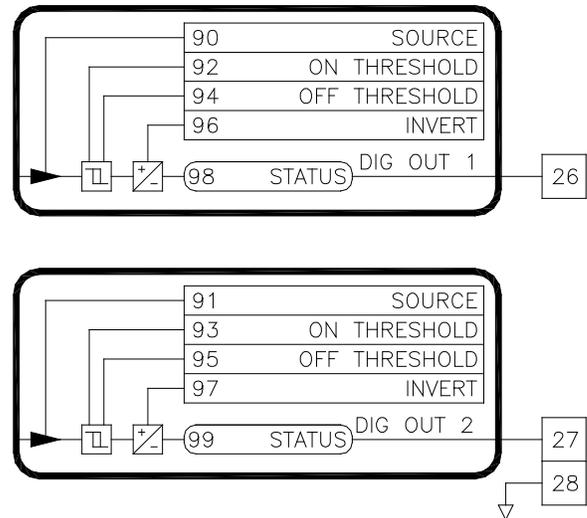


Figure 18: Digital Outputs

7.7 Analog Outputs

The MicroManager has three configurable analog outputs. Outputs 1 and 2 have 12 bit resolution and can be used as voltage and/or current outputs. Output 3 has 10 bit resolution and can only be used as a voltage output. Furthermore, output 3 must be connected to a high impedance input (>1megohm) for proper operation.

Mode (108, ICR, default: 0)

When Mode is 0 (unipolar), analog outputs 1 and 2 operate independently. When Mode is 1 (bipolar), both outputs are used in conjunction to provide a single bipolar output signal. Note that special wiring precautions are needed when using this mode. Terminal 29 is the positive output signal and Terminal 31 is the negative output signal. There must be no other connections between circuit common and the external device. An isolator board may be required. Refer to drawing D13304 on page 46 for an example bipolar connection. In this mode, the Source, Bias, & Gain parameters for Analog Output 2 are ignored.

Full Scale Voltage (109-110, Read/Write, default: 1)

The digital to analog converter (DAC) is capable of outputting a full scale voltage signal of 5V or 10V. By default, this parameter is set to 1 to provide a nominal 0 to +10VDC signal on the output. If only a 5VDC or lower signal is required, set this parameter to 0. This will reduce the full scale output voltage level to 5VDC while maintaining full 12 bit resolution. Further scaling of the output signal level is accomplished via the **Bias** and **Gain** parameters. Note that this setting also affects the full scale current output levels. For nominal 0 or 4 to 20mA outputs, this parameter must be set to 1.

Source (111-113, ICR, default: 0)

The tag of the parameter that will control the analog output.

Gain (114-116, Read/Write, default: 100.00%)

The maximum analog output level is controlled by the **Gain** parameter. A 10V or 20mA signal will be obtained when the **Gain** is at 100% and the value of the source parameter is also at 100.00%.

Bias (117-119, Read/Write, default: 0.00%)

The Bias parameter is used to set a minimum output voltage or current.

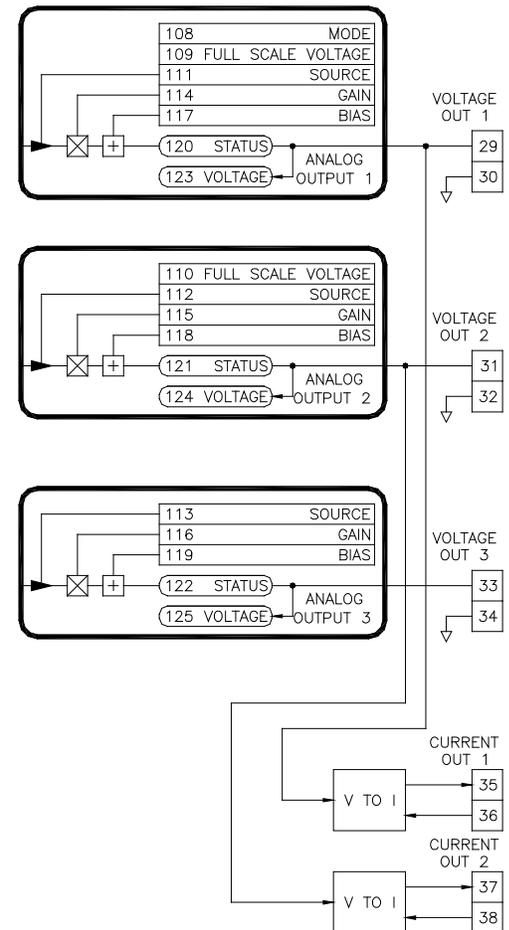


Figure 19: Analog Outputs

Status (120-122, Read Only)

The DAC bit values. Outputs 1 & 2 are 12 bits. Output 3 is 10 bit. The table below gives common readings assuming the Full Scale Voltage is set to 10V. If set to 5V, the Voltage and Current levels will be reduced by 50%.

Voltage	Current	12 Bit Status (1,2)	10 Bit Status (3)
10.0	20.0mA	4095	1023
7.5	15.0mA	3071	1021
5.0	10.0mA	2047	511
2.5	5.0mA	1024	255
0.0	0.0mA	0	0

Table 8: Analog Output Status Readings

Voltage (123-125, Read Only)

The voltage level of the analog outputs.

7.8 Start Stop Logic

The Start Stop Logic block controls the operating mode of the MicroManager.

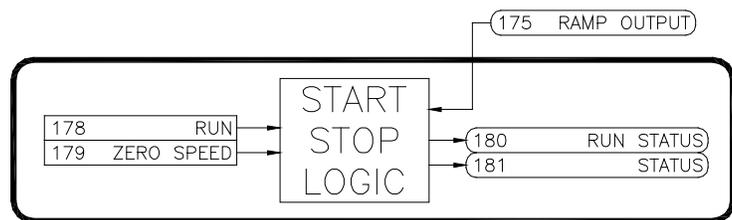


Figure 20: Start Stop Logic

Run (178, Read/Write, default: 0)

Setting this parameter to one, causes the MicroManager to enter the *Run* mode. A value of zero initiates a Stop sequence. The **Ramp Input** is clamped to zero, thus causing the **Ramp Output** to ramp down towards zero. When the **Ramp Output** is below the **Zero Speed** threshold, the MicroManager enters the *Stop* mode. Typically, the **Run** parameter is controlled (linked) by Digital Input 1 to facilitate external control via a contact closure.

Zero Speed (179, Read/Write, default: 2.00%)

The threshold that the **Ramp Output** must fall below before the unit changes from the *Ramping to Stop* mode to the *Stop* mode.

Run Status (180, Read Only)

A value of one indicates the unit is in the *Run* or *Ramping to Stop* modes. A value of zero indicates the unit is in the *Stop* mode.

Start Stop Status (181, Read Only)

A value of zero indicates the unit is in the *Stop* mode. A value of one indicates the unit is in the *Run* mode. A value of two indicates the unit is in the *Ramp to Stop* mode.

7.9 Accel Decel

The Accel Decel block provides a means to ramp the line speed up and down. This is primarily used in the velocity modes where a potentiometer input to the MicroManager is used to set the line speed. In the torque modes, a line speed is typically provided only in certain situations where it is used to provide the diameter calculation. In these situations, the ramp function is typically bypassed.

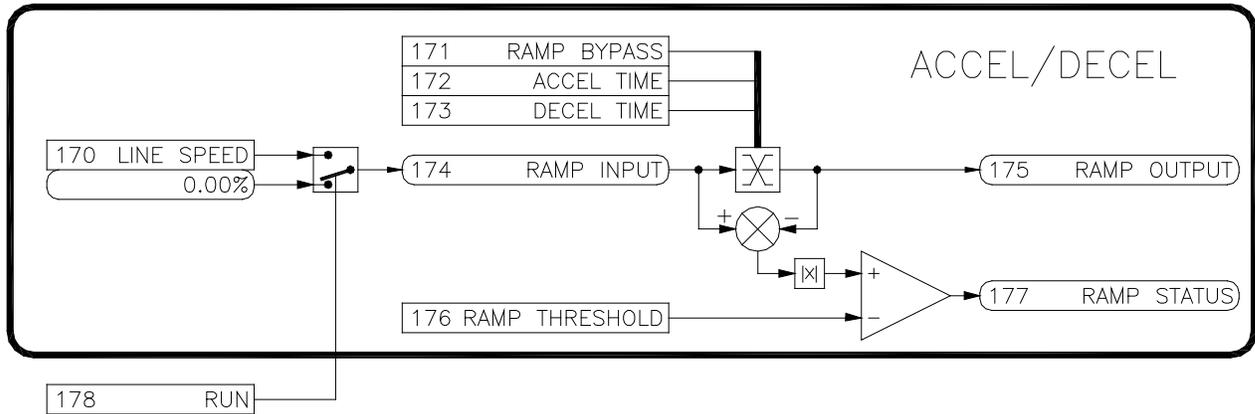


Figure 21: Accel Decel

Line Speed (170, Read/Write, default: 0.00%)

This parameter is typically linked from one of the analog or frequency inputs. It should be scaled so that it has a value of 0.00% when the line is stopped and a value of 100.00% when the line is at maximum speed.

Ramp Bypass (171, Read/Write, default: 0)

A value of one bypasses the ramp function. A value of zero allows the ramp function to operate. The **Ramp Output** will ramp to the value of **Ramp Input** at a rate controlled by the **Accel Time** and **Decel Time**.

Accel Time (172, Read/Write, default: 10.0 Seconds)

The accel adjustment controls the amount of time that it takes for Ramp Output to increase from 0.00% to 100.00%.

Decel Time (173, Read/Write, default: 10.0 Seconds)

The decel adjustment controls the amount of time that it takes for Ramp Output to decrease from 100.00% to 0.00%.

Ramp Input (174, Read Only)

The input to the ramp function. In the *Run* mode, **Ramp Input** has a value equal to **Line Speed**. In the *Stop* and *Ramping to Stop* modes, it has a value of 0.00%.

Ramp Output (175, Read Only)

The output of the ramp function.

Ramp Threshold (176, Read/Write, default: 5.00%)

This parameter defines the difference threshold between the **Ramp Input** and **Ramp Output** parameters in order for the **Ramp Status** to be active.

Ramp Status (177, Read Only)

A value of one indicates that the ramping function is active (i.e., the Ramp Output parameter is increasing or decreasing in value). A value of zero indicates that the output is not ramping.

7.10 Roll Speed Calculator

A problem encountered in center driven velocity 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.

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 or encoder on the line drive. The diameter information can be obtained through a number of different methods described below in the Diameter Select parameter selection.

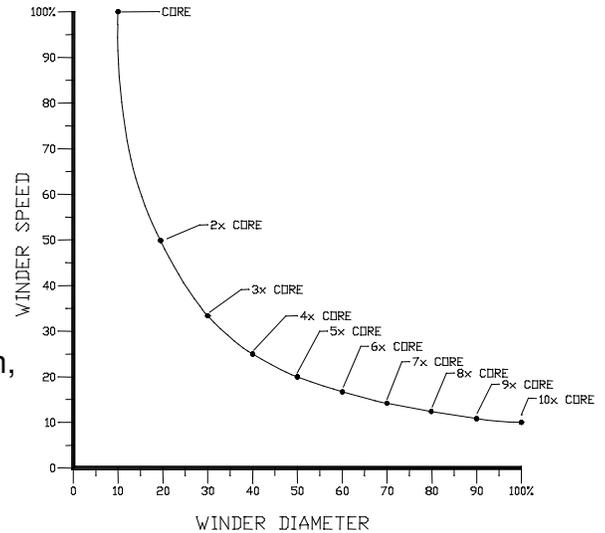


Figure 22: Winder Speed Vs Diameter

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.

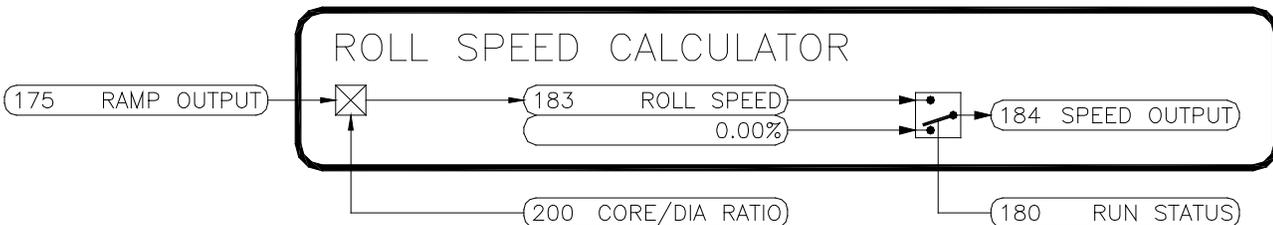


Figure 23: Roll Speed Calculator

Roll Speed (183, Read Only)

The calculated takeup or letoff center driven roll speed. This value is calculated by taking the **Ramp Output** and multiplying by the **Core/Dia Ratio** (see Diameter Calculator Block).

Speed Output (184, Read Only)

When in the *Run* mode, the **Speed Output** will be equal to the **Roll Speed**. Otherwise, it will be zero. This parameter is typically linked to one of the analog outputs when used.

7.11 Diameter Calculator

Diameter compensation is essential for stable and accurate tension control of winders and unwinders. The diameter calculator provides a number of methods of calculating the diameter.

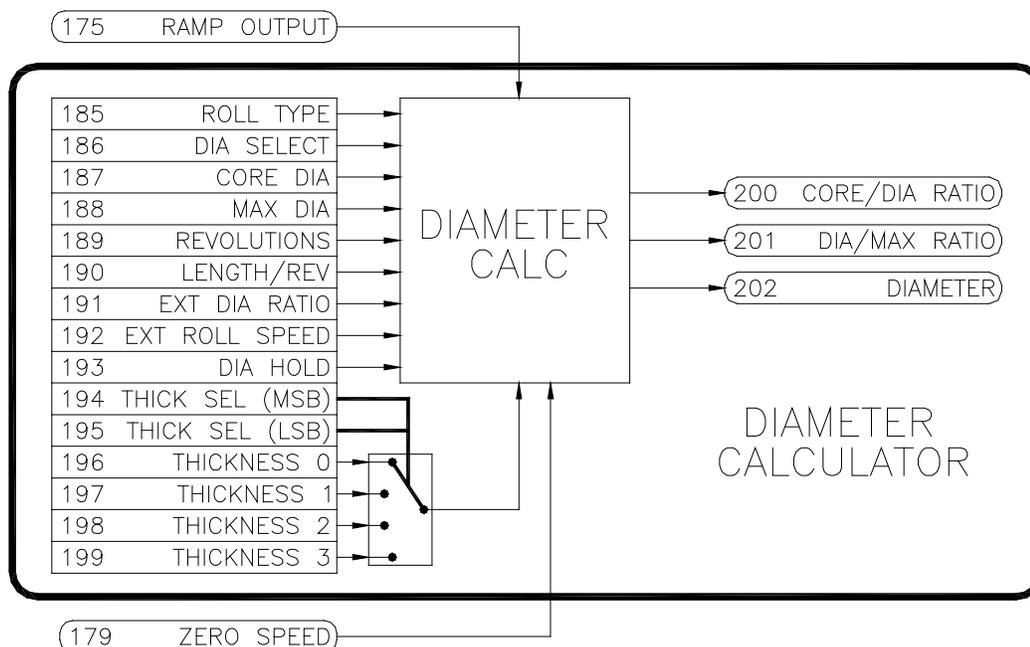


Figure 24: Diameter Calculator

Roll Type (185, Read/Write, default: 0)

Set to zero for winders, and one for unwinders. This parameter is needed by the Diameter Calculator only when **Diameter Select** is set for 2 (*Roll Revolutions*) or 3 (*Line Revolutions*).

Diameter Select (186, Read/Write, default: 0)

Determines which method is used to calculate the diameter.

0=None

The diameter calculator is disabled, and the **Diameter** is equal to the **Core Diameter**.

1=External Diameter

An external diameter signal is provided to the calculator. This signal could come from an ultrasonic measuring unit, laser sensor, or from a mechanical measuring device such as a rider arm and pot.

2=Roll Revolutions

The diameter is calculated by the material thickness and the number of revolutions of the takeup or letoff roll. The revolution count can be easily obtained from a pulse type encoder mounted on the takeup or letoff drive or roll.

3=Line Revolutions

The diameter is calculated by the number of line speed revolutions, length per revolution, and material thickness. The revolution count can be easily obtained from a pulse type encoder mounted on the line drive.

4=Line Speed & Roll Speed

The diameter is calculated by dividing the **Line Speed** signal by the **Roll Speed** signal. This method is only recommended for torque mode drives.

Core Diameter (187, Read/Write, default: 1.00 unit)

The diameter of an empty core. If multiple size cores are used, enter the smallest size. Any unit of measurement (inches, millimeters, etc...) can be used.

Maximum Diameter (188, Read/Write, default 10.00 units)

The maximum roll diameter. Unit of measurement must be the same as the **Core Diameter**.

Revolutions (189, Read/Write, default: 0)

The number of revolutions of the takeup/letoff roll or the line speed roll. This value is used to calculate the diameter when **Diameter Select** is set for *2 (Roll Revolutions)* or *3 (Line Revolutions)*. Typically, the Revolution Counter on the Frequency Input is linked to this parameter when it is used.

Length Per Revolution (190, Read/Write, default: 0.001 units)

The length of material per one revolution of the Line Speed pulse counter. Used to calculate the diameter when **Diameter Select** is set to *3 (Line Revolutions)*. The unit of measurement must be the same as that used in the **Core Diameter**. Typically, when used, this would be set to the circumference of the line speed roller in contact with the material.

External Diameter Ratio (191, Read/Write, default: 0.00%)

A ratio that is proportional to the diameter of the takeup or letoff roll. Used to calculate the diameter when **Diameter Select** is set to *1 (External)*. Typically, an external analog input is linked to this parameter to provide the diameter information. The signal should be scaled via the Gain and Bias of the analog input so that this value reads 0.00% at **Core Diameter** and 100.00% at **Maximum Diameter**.

External Roll Speed (192, Read/Write, default: 0.00%)

Signal used to calculate **Diameter** along with the **Line Speed**. Used to calculate the diameter when **Diameter Select** is set to *4 (Line Speed & Roll Speed)*. Typically, an analog or frequency input is linked to this parameter to provide the calculator with the winder or unwinder speed.

Diameter Hold (193, Read/Write, default: 0)

When **Diameter Select** is set to *4 (Line Speed & Roll Speed)*, this parameter can be used to hold or pause the diameter calculation. This would need to be used only if the line will be stopped before completely winding or unwinding a full roll AND it is necessary to maintain tension on the material while stopped. Since the diameter is calculated from the Line and Roll speed signals (and these signals will go to zero

when the process is stopped), the calculated diameter will fall to the **Core Diameter** setting. This in turn will cause the tension on the material to decrease. When the process is restarted, the Line and Roll speed signals are again present, and the diameter calculation will return to normal. For many applications, this decrease in tension while stopped is acceptable. However, for processes that require the tension to be maintained while stopped, external logic will be required to control the **Diameter Hold** parameter (typically linked from a digital input).

Initially, **Diameter Hold** should be zero when a new roll is started. Before the process is stopped, **Diameter Hold** should be set to one (pausing the diameter calculation). When the process is restarted, **Diameter Hold** should be set back to zero (allowing the calculation to be performed).

Thickness Select (194-195, Read/Write, default: 0)

In the cases where the thickness of the material is used to calculate the diameter (**Diameter Select** equals 2 (*Roll Revolutions*) or 3 (*Line Revolutions*)), the diameter calculator provides four thickness settings to accommodate different materials. Each of these four settings can be selected by the **Thickness Select** parameters.

Thickness Select MSB	Thickness Select LSB	Thickness Used
0	0	P196: Thickness 0
0	1	P197: Thickness 1
1	0	P198: Thickness 2
1	1	P199: Thickness 3

Table 9: Thickness Selections

Thickness 0-3 (196-199, Read/Write, default: 0.000 units)

These parameters allow four material thickness presets to be defined. The actual thickness used by the calculator is determined by the **Thickness Select** parameters. The unit of measurement should be the same as that of the **Core Diameter**.

Core/Diameter Ratio (200, Read Only)

The ratio obtained by dividing the **Core Diameter** by the calculated **Diameter**. This value is used along with the **Ramp Output (Line Speed)** to calculate the **Roll Speed**.

Diameter/Max Ratio (201, Read Only)

The ratio obtained by dividing the calculated **Diameter** by the **Max Diameter**. This value is used along with **Tension Demand** to calculate **Diameter Torque**.

Diameter (202, Read Only)

The calculated diameter. Unit of measurement is the same as the **Core Diameter**.

7.12 Tension Calculator

The tension calculator is used to provide a **Tension Demand** signal to the torque calculator block. In some cases, decreasing tension (taper tension) is desirable to prevent telescoping and/or wrinkling of inner layers of material. The tension calculator can be configured to provide tapering tension starting at any point in the roll. **Tension Demand** will decrease by a percentage of the **Tension Setpoint** from the **Taper Diameter** setting to the **Max Diameter**.

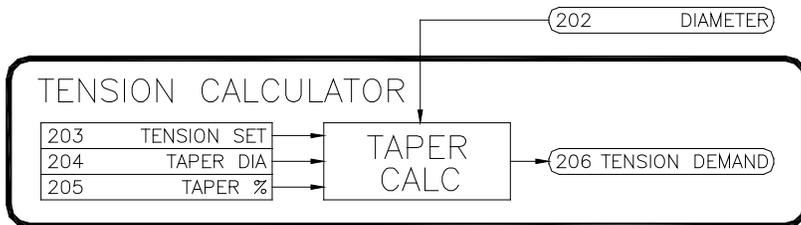


Figure 25: Tension Calculator

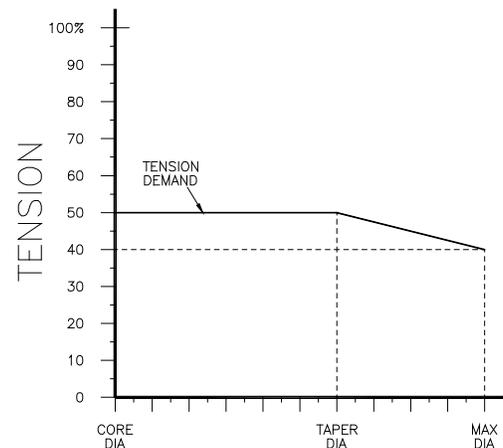


Figure 26: Taper Tension Example

Tension Setpoint (203, Read/Write, default: 0.00%)

The desired tension setpoint when the torque mode is used. Typically, a potentiometer connected to one of the analog inputs is used to adjust this value.

Taper Diameter (204, Read/Write, default: 0.00%)

The diameter level at which tapering begins. Unit of measurement is the same as the **Core Diameter**.

Taper Percentage (205, Read/Write, default: 0.00%)

The desired percentage of the **Tension Setpoint** that the **Tension Demand** signal will be tapered when **Diameter** is at **Max Diameter**. Refer to Figure 26. In this example, the **Tension Setpoint**=50.00% and the **Taper Percentage**=20.00%. Thus, at **Max Diameter**, the **Tension Demand** signal has decreased by 10.00% (20.00% of the **Tension Setpoint**).

Tension Demand (206, Read Only)

The tapered tension demand output. **Tension Demand** will be equal to **Tension Setpoint** as the **Diameter** increases from Core Diameter up to the Taper Diameter point. As **Diameter** increases, **Tension Demand** is decreased at a rate controlled by the **Taper Percentage**.

When the calculated **Diameter** is less than the **Taper Diameter**, the **Tension Demand** will be equal to the **Tension Setpoint**. As the Diameter increases In a CTCW system, this value is used to determine the amount of **Diameter Torque**.

7.13 Torque Calculator

In torque mode control schemes, the motor torque required to maintain a constant tension is directly proportional to diameter. The Torque Calculator Block provides a Torque Output signal that is proportional to the calculated diameter (from the Diameter Calculator Block). This level of torque is set by the Tension Demand signal (from the Tension Calculator Block).

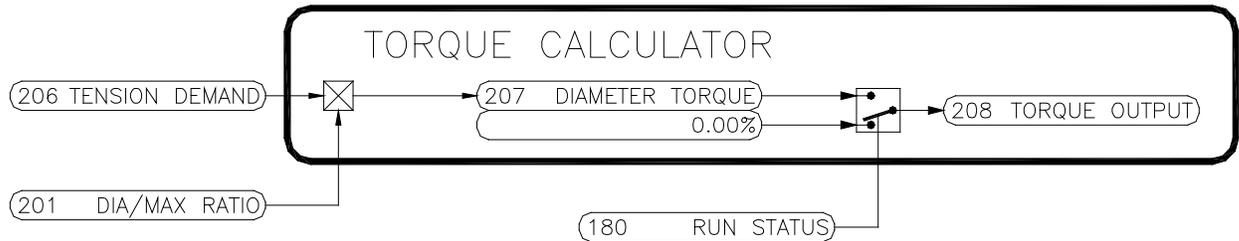


Figure 27: Torque Calculator

Diameter Torque (207, Read Only)

Diameter Torque is calculated by multiplying **Tension Demand** by the **Diameter/Max Ratio**.

Torque Output (208, Read Only)

When in the *Run* mode, the **Torque Output** will be equal to **Diameter Torque**. Otherwise, it will be zero. This parameter is typically linked to one of the analog outputs when used.

7.14 Internal Links

The internal links can be used to connect or link parameters together. The MicroManager provides 10 links for custom configuration. Each link has a source and a destination.

Note: When two parameters with different numbers of decimal places are linked together the following occurs: The source parameter value is reformatted into an integer without any decimal

places. The number of decimal places of the destination parameter is then applied to the resulting integer. For example, if a source parameter has a value of 12.34% (2 decimals) and it is linked to an accel/decel time parameter (1 decimal), 12.34% is converted to an integer value of 1234, and then reformatted with 1 decimal place, 123.4. Therefore, the destination will contain the value 123.4 seconds.

Source (ICR, default: 0)

The tag of the source parameter.

Destination (ICR, default: 0)

The tag of the destination parameter.

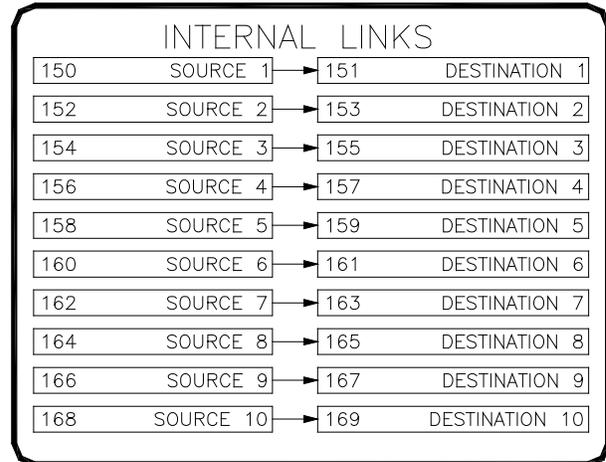


Figure 28: Torque Calculator

7.15 System Parameters

Save (1, Read/Write, default: 0)

Parameter changes take affect immediately. However, in order to make the changes permanent, the save command must be used. Setting this parameter to 1 causes all of the parameters to be written to the internal EEPROM. The Save Status parameter can be used to determine if the parameters were saved successfully.

Save Status (2, Read Only)

Result of the Save command.

Save Status	Description
0	Saved Successfully
1	Saving in progress
2	Error

Table 10: Save Status Readings

SYSTEM	
0	TRASH
1	SAVE
2	SAVE STATUS
3	INITIALIZE
4	MICROMANAGER MODEL
5	CUSTOMIZATION CODE(LSW)
6	CUSTOMIZATION CODE(MSW)
7	PROCESSOR ID
8	PROCESSOR REVISION
9	FIRMWARE VERSION
10	BOOT FIRMWARE VERSION
11	SYSTEM STATUS
12	TOTAL PARAMETERS
13	CHANGES NEED SAVING
14	LIST MODIFIED PARAMS

Figure 29: System Parameters

Initialize (3, Read/Write, default: 0)

Used to initialize the MicroManager to one of the pre-defined control configurations. Refer to the Quick Start Procedure on page 8 for information. Set to 95 to re-initialize

the unit to its factory preset state.

MicroManager Model (4, Read/Write, default: 1)

This parameter reflects the MicroManager Model. The CRG model is 1.

Customization Code (5-6, Read Only)

For engineering use only.

Processor ID (7, Read Only)

Identification code for the internal processor. For engineering use only.

Processor Revision (8, Read Only)

Hardware revision of the internal processor. For engineering use only.

Firmware Version (9, Read Only)

Version code of the internal firmware.

Boot Firmware Version (10, Read Only)

Version code of the internal boot firmware.

System Status (11, Read Only)

Status register that provides the source of the most recent reset. For engineering use only.

System Status	Description
1	Brown Out Reset
2	Power On Reset
4	Power Down Detection
8	Watchdog Timeout
16	Reset Instruction

Table 11: System Status Readings

Total Parameters (12, Read Only)

The total number of parameters.

Changes Need Saving (13, Read Only)

Status bit that indicates parameters have been changed but not saved.

List Modified Parameters (14, Read/Write, default: 0)

Setting this parameter to one allows the user to scroll through a list of all Read/Write parameters that have been modified from their default values by using the Up and Down buttons. If no parameters have been modified, the display shows **nonE**. The Enter button must be pressed to exit the list.

7.16 Auxiliary Parameters

The MicroManager provides 10 auxiliary parameters for general use. One specific function the auxiliary parameters can be used for is to tie an input directly to an output.

AUXILIARY	
140	AUX 1
141	AUX 2
142	AUX 3
143	AUX 4
144	AUX 5
145	AUX 6
146	AUX 7
147	AUX 8
148	AUX 9
149	AUX 10

Figure 30: Auxiliary Parameters

7.17 Parameter Table

The following two tables lists all the MicroManager CRG parameters and their properties. Table 12 is sorted by Tag Number and is sorted by Parameter Name. ICR stands for *Inhibit Change while Running* and identifies the parameters that cannot be modified while the unit is in the Run mode. Furthermore, RO indicates *Read-Only* parameters.

Table 12: Parameters by Tag

Tag	Parameter Name	Min	Max	ICR	RO	Preset	User
0	Trash	0	65535			0	
1	Save	0:False	1:True			0:False	
2	Save Status	0: Save Successful 1: Saving in Progress 2: Save Error			RO	0:Save Successful	
3	Initialize	Refer to page 8		ICR		0	
4	MicroManager Model	0	65535		RO	1:CRG	
5	Customization Code (LSW)	0	65535		RO	0	
6	Customization Code (MSW)	0	65535		RO	0	
7	Processor ID	0	2047		RO	0	
8	Processor Hardware Revision	0	31		RO	0	
9	Firmware Version	0	9999		RO	-	
10	Boot Version	0	9999		RO	-	
11	System Status	0	65535		RO	0	
12	Total Parameters	0	65535		RO	-	
13	Changes Need Saving	0:False	1:True		RO	0:False	
14	List Modified Parameters	0:False	1:True			0:False	
15	Analog Input 1 Destination	0	208	ICR		0	
16	Analog Input 2 Destination	0	208	ICR		0	
17	Analog Input 1 Status	0	4092		RO	0	
18	Analog Input 2 Status	0	4092		RO	0	
19	Analog Input 1 Voltage	0.00V	12.00V		RO	0.00V	
20	Analog Input 2 Voltage	0.00V	12.00V		RO	0.00V	
21	Analog Input 1 Filtering	0	15			0	
22	Analog Input 2 Filtering	0	15			0	
23	Analog Input 1 Begin Calibration	0:False	1:True	ICR		0	
24	Analog Input 2 Begin Calibration	0:False	1:True	ICR		0	
25	Analog Input 1 0% Calibration	0	4092			0	
26	Analog Input 2 0% Calibration	0	4092			0	
27	Analog Input 1 100% Calibration	0	4092			4092	
28	Analog Input 2 100% Calibration	0	4092			4092	
29	Analog Input 1 Bias	-200.00%◆	200.00%◆			0.00%◆	

Tag	Parameter Name	Min	Max	ICR	RO	Preset	User
30	Analog Input 2 Bias	-200.00%◆	200.00%◆			0.00%◆	
31	Analog Input 1 Gain	-200.00%◆	200.00%◆			100.00%◆	
32	Analog Input 2 Gain	-200.00%◆	200.00%◆			100.00%◆	
33	Reserved	0	65535		RO	0	
34	Reserved	0	65535		RO	0	
35	Reserved	0	65535		RO	0	
36	Reserved	0	65535		RO	0	
37	Reserved	0	65535		RO	0	
38	Reserved	0	65535		RO	0	
39	Reserved	0	65535		RO	0	
40	Reserved	0	65535		RO	0	
41	Digital Input 1 Destination	0	208	ICR		0	
42	Digital Input 2 Destination	0	208	ICR		0	
43	Digital Input 3 Destination	0	208	ICR		0	
44	Digital Input 4 Destination	0	208	ICR		0	
45	Digital Input 1 Open Value	-200.00%◆	200.00%◆			0.00%◆	
46	Digital Input 2 Open Value	-200.00%◆	200.00%◆			0.00%◆	
47	Digital Input 3 Open Value	-200.00%◆	200.00%◆			0.00%◆	
48	Digital Input 4 Open Value	-200.00%◆	200.00%◆			0.00%◆	
49	Digital Input 1 Closed Value	-200.00%◆	200.00%◆			0.01%◆	
50	Digital Input 2 Closed Value	-200.00%◆	200.00%◆			0.01%◆	
51	Digital Input 3 Closed Value	-200.00%◆	200.00%◆			0.01%◆	
52	Digital Input 4 Closed Value	-200.00%◆	200.00%◆			0.01%◆	
53	Digital Input 1 Status	0:Off	1:On		RO	0:Off	
54	Digital Input 2 Status	0:Off	1:On		RO	0:Off	
55	Digital Input 3 Status	0:Off	1:On		RO	0:Off	
56	Digital Input 4 Status	0:Off	1:On		RO	0:Off	
57	Reserved	0	65535		RO	0	
58	Reserved	0	65535		RO	0	
59	Reserved	0	65535		RO	0	
60	Reserved	0	65535		RO	0	
61	Reserved	0	65535		RO	0	
62	Reserved	0	65535		RO	0	
63	Reserved	0	65535		RO	0	
64	Reserved	0	65535		RO	0	
65	Frequency Input Destination	0	208	ICR		0	
66	Frequency Input Status	0	50000Hz		RO	0Hz	
67	Frequency Input Filtering	0	15			0	
68	Frequency Input Begin Calibration	0:False	1:True	ICR		0:False	
69	Frequency Input 0% Calibration	0	50000Hz			0Hz	
70	Frequency Input 100% Calibration	0	50000Hz			50000Hz	
71	Frequency Input Bias	-200.00%◆	200.00%◆			0.00%◆	
72	Frequency Input Gain	-200.00%◆	200.00%◆			100.00%◆	
73	Revolution Count Destination	0	208	ICR		0	
74	Count (LSW)	0	65535		RO	0	
75	Count (MSW)	0	65535		RO	0	
76	Pulses Per Revolution	1	65535			1	
77	Count Enable	0:False	1:True			0:False	
78	Count Reset	0:False	1:True			0:False	
79	Reserved	0	65535		RO	0	
80	Reserved	0	65535		RO	0	
81	Reserved	0	65535		RO	0	
82	Reserved	0	65535		RO	0	
83	Reserved	0	65535		RO	0	
84	Reserved	0	65535		RO	0	

Tag	Parameter Name	Min	Max	ICR	RO	Preset	User
85	Reserved	0	65535		RO	0	
86	Reserved	0	65535		RO	0	
87	Up Button Status	0:Off	1:On		RO	0:Off	
88	Down Button Status	0:Off	1:On		RO	0:Off	
89	Enter Button Status	0:Off	1:On		RO	0:Off	
90	Digital Output 1 Source	0	208	ICR		0	
91	Digital Output 2 Source	0	208	ICR		0	
92	Digital Output 1 On Threshold	-200.00%◆	200.00%◆			0.01%◆	
93	Digital Output 2 On Threshold	-200.00%◆	200.00%◆			0.01%◆	
94	Digital Output 1 Off Threshold	-200.00%◆	200.00%◆			0.00%◆	
95	Digital Output 2 Off Threshold	-200.00%◆	200.00%◆			0.00%◆	
96	Digital Output 1 Invert	0:False	1:True			0:False	
97	Digital Output 2 Invert	0:False	1:True			0:False	
98	Digital Output 1 Status	0:Off	1:On		RO	0:Off	
99	Digital Output 2 Status	0:Off	1:On		RO	0:Off	
100	Reserved	0	65535		RO	0	
101	Reserved	0	65535		RO	0	
102	Reserved	0	65535		RO	0	
103	Reserved	0	65535		RO	0	
104	Reserved	0	65535		RO	0	
105	Reserved	0	65535		RO	0	
106	Reserved	0	65535		RO	0	
107	Reserved	0	65535		RO	0	
108	Analog Output Mode	0:Unipolar	1:Bipolar	ICR		0:Unipolar	
109	Analog Output 1 Full Scale Voltage	0:5V	1:10V			1:10V	
110	Analog Output 2 Full Scale Voltage	0:5V	1:10V			1:10V	
111	Analog Output 1 Source	0	208	ICR		0	
112	Analog Output 2 Source	0	208	ICR		0	
113	Analog Output 3 Source	0	208	ICR		0	
114	Analog Output 1 Gain	-200.00%	200.00%			100.00%	
115	Analog Output 2 Gain	-200.00%	200.00%			100.00%	
116	Analog Output 3 Gain	-200.00%	200.00%			100.00%	
117	Analog Output 1 Bias	-200.00%	100.00%			0.00%	
118	Analog Output 2 Bias	-200.00%	100.00%			0.00%	
119	Analog Output 3 Bias	-200.00%	100.00%			0.00%	
120	Analog Output 1 Status	0	4095		RO	0	
121	Analog Output 2 Status	0	4095		RO	0	
122	Analog Output 3 Status	0	4095		RO	0	
123	Analog Output 1 Voltage	0.00V	10.00V		RO	0.00V	
124	Analog Output 2 Voltage	0.00V	10.00V		RO	0.00V	
125	Analog Output 3 Voltage	0.00V	10.00V		RO	0.00V	
126	Analog Output 1 Force	0:Off	1:On			0:Off	
127	Analog Output 2 Force	0:Off	1:On			0:Off	
128	Analog Output 3 Force	0:Off	1:On			0:Off	
129	Reserved	0	65535		RO	0	
130	Reserved	0	65535		RO	0	
131	Reserved	0	65535		RO	0	
132	Reserved	0	65535		RO	0	
133	Reserved	0	65535		RO	0	
134	Network Address	1	247			1	
135	Baud Rate	0: 2400 1: 4800 2: 9600 3: 19200 4: 38400				4: 38400	

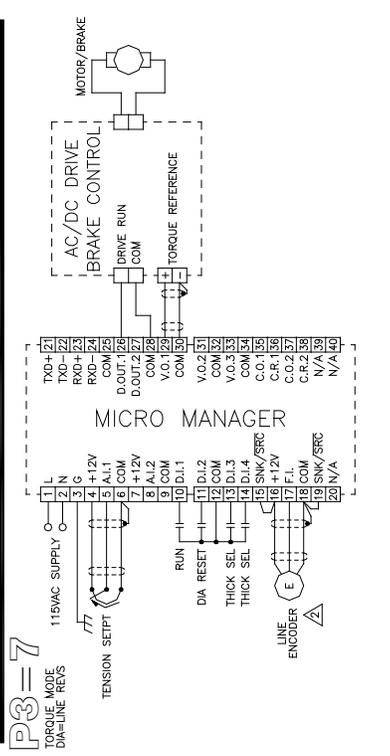
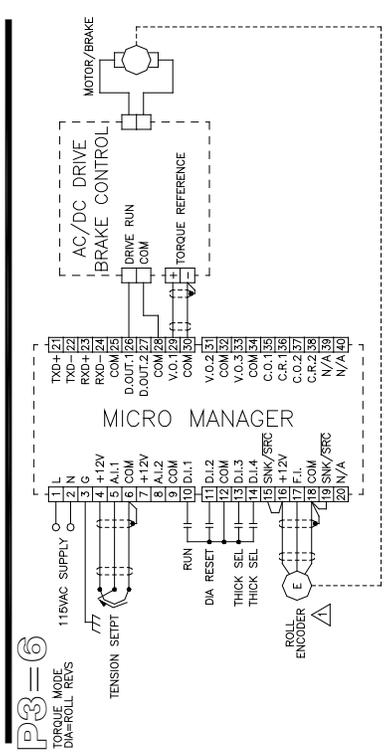
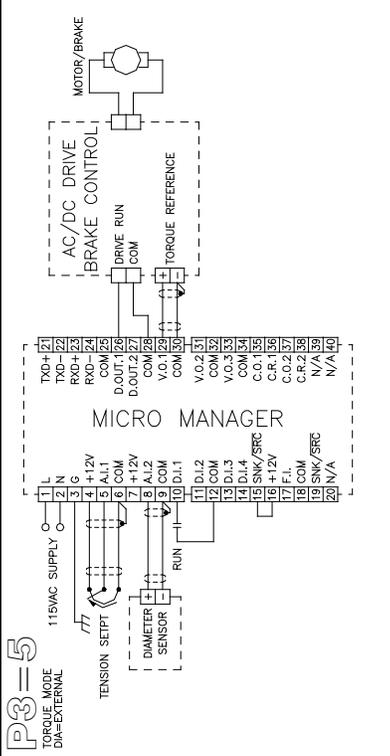
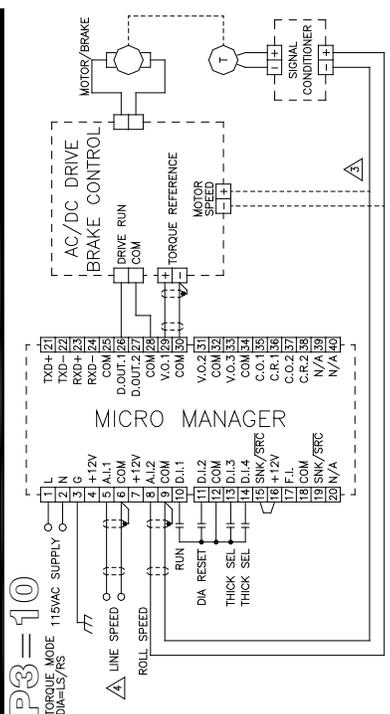
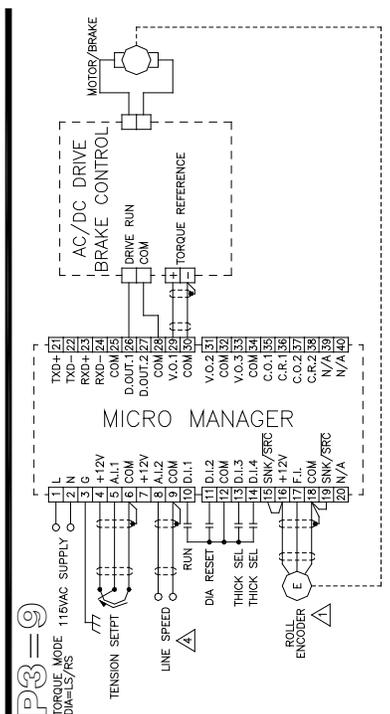
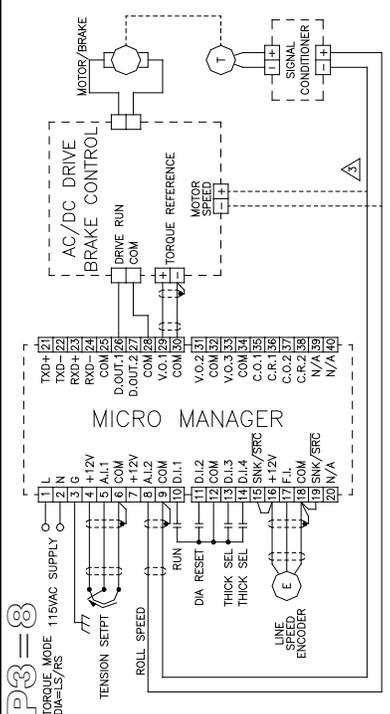
Tag	Parameter Name	Min	Max	ICR	RO	Preset	User
136	Parity-Stop Bits	0: No Parity, 1 Stop Bit 1: No Parity, 2 Stop Bits 2: Even Parity, 1 Stop Bit 3: Odd Parity, 1 Stop Bit				1: No Parity, 2 Stop Bits	
137	Addressing Mode	0	1			1	
138	Addressing Mode Test 1	21845	21845		RO	21845	
139	Addressing Mode Test 2	43690	43690		RO	43690	
140	Aux 1	0	65535			0	
141	Aux 2	0	65535			0	
142	Aux 3	0	65535			0	
143	Aux 4	0	65535			0	
144	Aux 5	0	65535			0	
145	Aux 6	0	65535			0	
146	Aux 7	0	65535			0	
147	Aux 8	0	65535			0	
148	Aux 9	0	65535			0	
149	Aux 10	0	65535			0	
150	Internal Link 1 Source	0	208	ICR		0	
151	Internal Link 1 Destination	0	208	ICR		0	
152	Internal Link 2 Source	0	208	ICR		0	
153	Internal Link 2 Destination	0	208	ICR		0	
154	Internal Link 3 Source	0	208	ICR		0	
155	Internal Link 3 Destination	0	208	ICR		0	
156	Internal Link 4 Source	0	208	ICR		0	
157	Internal Link 4 Destination	0	208	ICR		0	
158	Internal Link 5 Source	0	208	ICR		0	
159	Internal Link 5 Destination	0	208	ICR		0	
160	Internal Link 6 Source	0	208	ICR		0	
161	Internal Link 6 Destination	0	208	ICR		0	
162	Internal Link 7 Source	0	208	ICR		0	
163	Internal Link 7 Destination	0	208	ICR		0	
164	Internal Link 8 Source	0	208	ICR		0	
165	Internal Link 8 Destination	0	208	ICR		0	
166	Internal Link 9 Source	0	208	ICR		0	
167	Internal Link 9 Destination	0	208	ICR		0	
168	Internal Link 10 Source	0	208	ICR		0	
169	Internal Link 10 Destination	0	208	ICR		0	
170	Line Speed	-100.00%	100.00%			0.00%	
171	Ramp Bypass	0:False	1:True			0:False	
172	Accel Time	0.1s	600.0s			10.0s	
173	Decel Time	0.1s	600.0s			10.0s	
174	Ramp Input	-100.00%	100.00%		RO	0.00%	
175	Ramp Output	-100.00%	100.00%		RO	0.00%	
176	Ramp Threshold	0.00%	100.00%		RO	5.00%	
177	Ramp Status	0:False	1:True		RO	0:False	
178	Run	0:False	1:True			0:False	
179	Zero Speed Setpoint	0.00%	100.00%			2.00%	
180	Run Status	0:False	1:True		RO	0:False	
181	Start/Stop Status	0: Stop 1: Run 2: Ramping To Stop			RO	0:Stop	
182	Reserved	0	65535		RO	0	
183	Roll Speed	-100.00%	100.00%		RO	0.00%	
184	Speed Output	-100.00%	100.00%		RO	0.00%	
185	Roll Type	0:Winder	1:Unwinder	ICR		0:Winder	

Tag	Parameter Name	Min	Max	ICR	RO	Preset	User
186	Diameter Select	0: Off 1: External 2: Roll Revolutions 3: Line Revolutions 4: Line & Winder Speeds		ICR		0:Off	
187	Core Diameter	0.01 UU♣	200.00 UU♣			1.00 UU♣	
188	Max Diameter	0.01 UU♣	200.00 UU			10.00 UU♣	
189	Revolutions	0	65535			0	
190	Length Per Revolution	0.001 UU♣	20.000 UU♣			0.001 UU♣	
191	External Diameter Ratio	0.00%	100.00%			0.00%	
192	External Roll Speed	0.00%	100.00%			0.00%	
193	Diameter Hold	0:False	1:True			0:False	
194	Thickness Select (MSB)	0	1			0	
195	Thickness Select (LSB)	0	1			0	
196	Thickness 0	0.001 UU♣	20.000 UU♣			0.001 UU♣	
197	Thickness 1	0.001 UU♣	20.000 UU♣			0.001 UU♣	
198	Thickness 2	0.001 UU♣	20.000 UU♣			0.001 UU♣	
199	Thickness 3	0.001 UU♣	20.000 UU♣			0.001 UU♣	
200	Core/Diameter Ratio	0.00%	100.00%		RO	0.00%	
201	Diameter/Max Ratio	0.00%	100.00%		RO	0.00%	
202	Diameter	0.01 UU♣	200.00 UU♣		RO	0.00 UU♣	
203	Tension Setpoint	0.00%	100.00%			0.00%	
204	Taper Diameter	0.00 UU♣	200.00 UU♣			0.00 UU♣	
205	Taper Percentage	0.00%	100.00%			0.00%	
206	Tension Demand	0.00%	100.00%		RO	0.00%	
207	Diameter Torque	0.00%	100.00%		RO	0.00%	
208	Torque Output	0.00%	100.00%		RO	0.00%	

-
- ♣ UU=User Units. Can be any type of length in engineering units such as inches, millimeters, etc... All parameters of this type must be entered in the same units.
 - ◆ Note: The units and decimal places shown are the default. However, these values will change to match those of the source or destination parameter.

Notes:

- △ IN THIS DIAGRAM, A MOTOR MOUNTED ENCODER PROVIDES THE ROLL SPEED FEEDBACK. THIS SIGNAL COULD ALSO BE PROVIDED BY A PROXIMITY SWITCH ON THE MOTOR OR ROLL SHEET. FOR OTHER WIRING SCHEMES, SEE SHEET 1 FOR OTHER WIRING SCHEMES.
- △ IN THIS DIAGRAM, A MOTOR MOUNTED ENCODER PROVIDES THE LINE SPEED FEEDBACK. THIS SIGNAL COULD ALSO BE PROVIDED BY A PROXIMITY SWITCH ON THE MOTOR OR ROLL SHEET. FOR OTHER WIRING SCHEMES, SEE SHEET 1 FOR OTHER WIRING SCHEMES.
- △ IN THIS DIAGRAM, TACHOMETERS PROVIDES THE ROLL SPEED FEEDBACK VIA A SIGNAL CONDITIONING CARD. IF AVAILABLE, AN ANALOG SIGNAL PROPORTIONAL TO ROLL SPEED MAY BE USED FROM THE DRIVE.
- △ POSSIBLE SOURCES FOR THE LINE SPEED SIGNAL ARE THE LINE DRIVE OR A CONDITIONED TACHOMETER ON THE LINE MOTOR.



Drives by Revolution

MODEL: BKP 10/08

APPROVED BY: DATE:

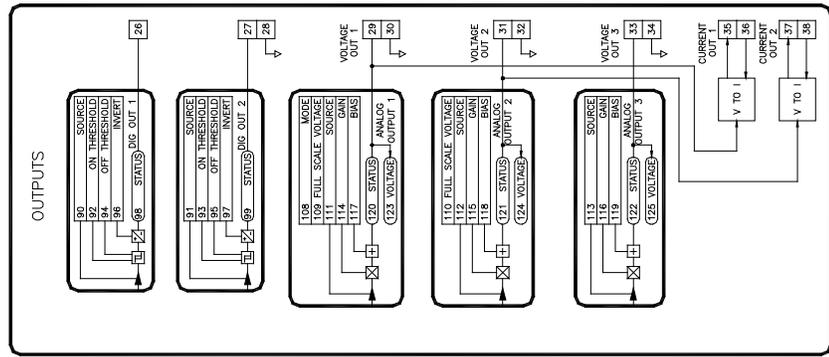
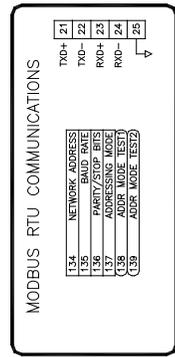
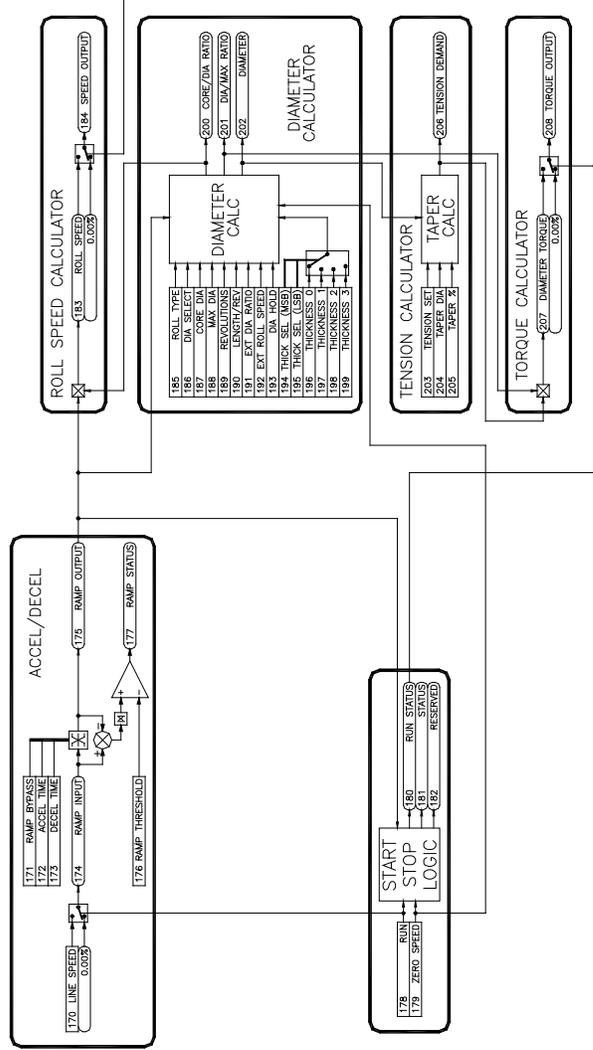
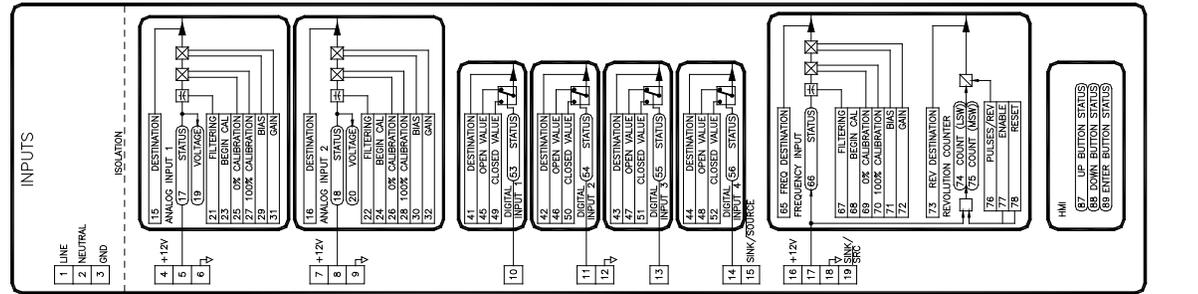
PART NO. = 200
 2 REV. NO. = 200

MICROMANAGER
 GENERAL CONNECTIONS

DRAWING NUMBER: **D13304** REV. **B** SH. **2** OF **2**

Micromanager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: FACTORY PRESET



INTERNAL LINKS

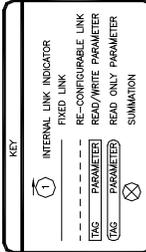
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152	SOURCE 2	153	DESTINATION 2
154	SOURCE 3	155	DESTINATION 3
156	SOURCE 4	157	DESTINATION 4
158	SOURCE 5	159	DESTINATION 5
160	SOURCE 6	161	DESTINATION 6
162	SOURCE 7	163	DESTINATION 7
164	SOURCE 8	165	DESTINATION 8
166	SOURCE 9	167	DESTINATION 9
168	SOURCE 10	169	DESTINATION 10

AUXILIARY

140	AUX 1
141	AUX 2
142	AUX 3
143	AUX 4
144	AUX 5
145	AUX 6
146	AUX 7
147	AUX 8
148	AUX 9
149	AUX 10

SYSTEM

0	TRASH
1	SAVE
2	INITIALIZED
3	INITIALIZE
4	CUSTOMIZATION CODE(LSW)
5	CUSTOMIZATION CODE(MSW)
6	PROCESSOR ID
7	PROFESSOR ID
8	FIRMWARE VERSION
9	TO BOOT FIRMWARE VERSION
10	SYSTEM STATUS
11	SYSTEM STATUS
12	CHANGES NEED SAVING
13	CHANGES NEED SAVING
14	LIST MODIFIED PARAMS



BKP 10/17/00

CAUTION

DO NOT REMOVE THIS LABEL

REV. 1 OF 8

DATE: 10/17/00

BY: [Signature]

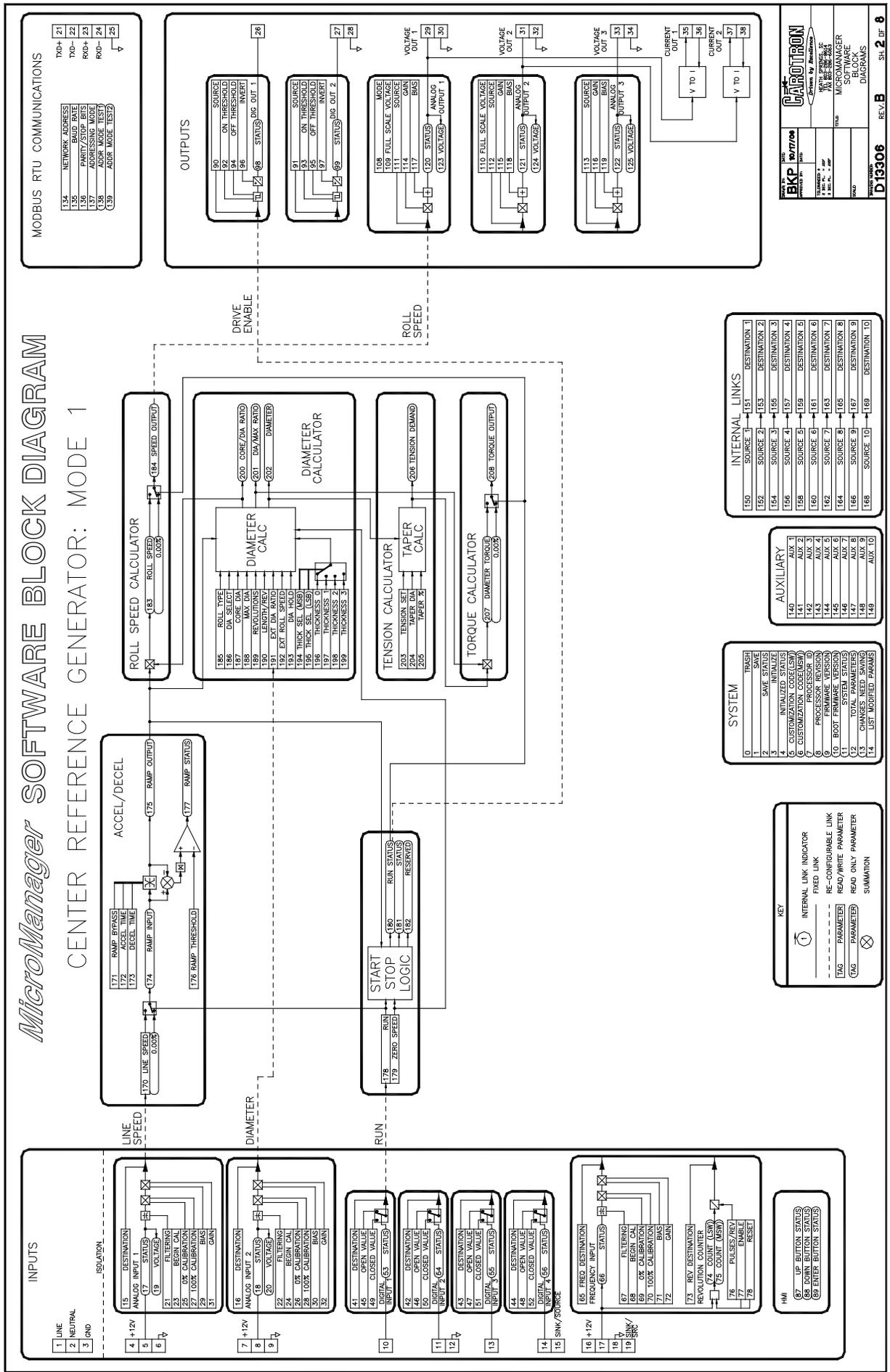
DESCRIPTION: MICROMANAGER SOFTWARE DIAGRAMS

REV. B

D13308

Micromanager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODE 1



BKP rev7/06

REVISED BY: []
DATE: []

DESIGNED BY: []
DATE: []

TESTED BY: []
DATE: []

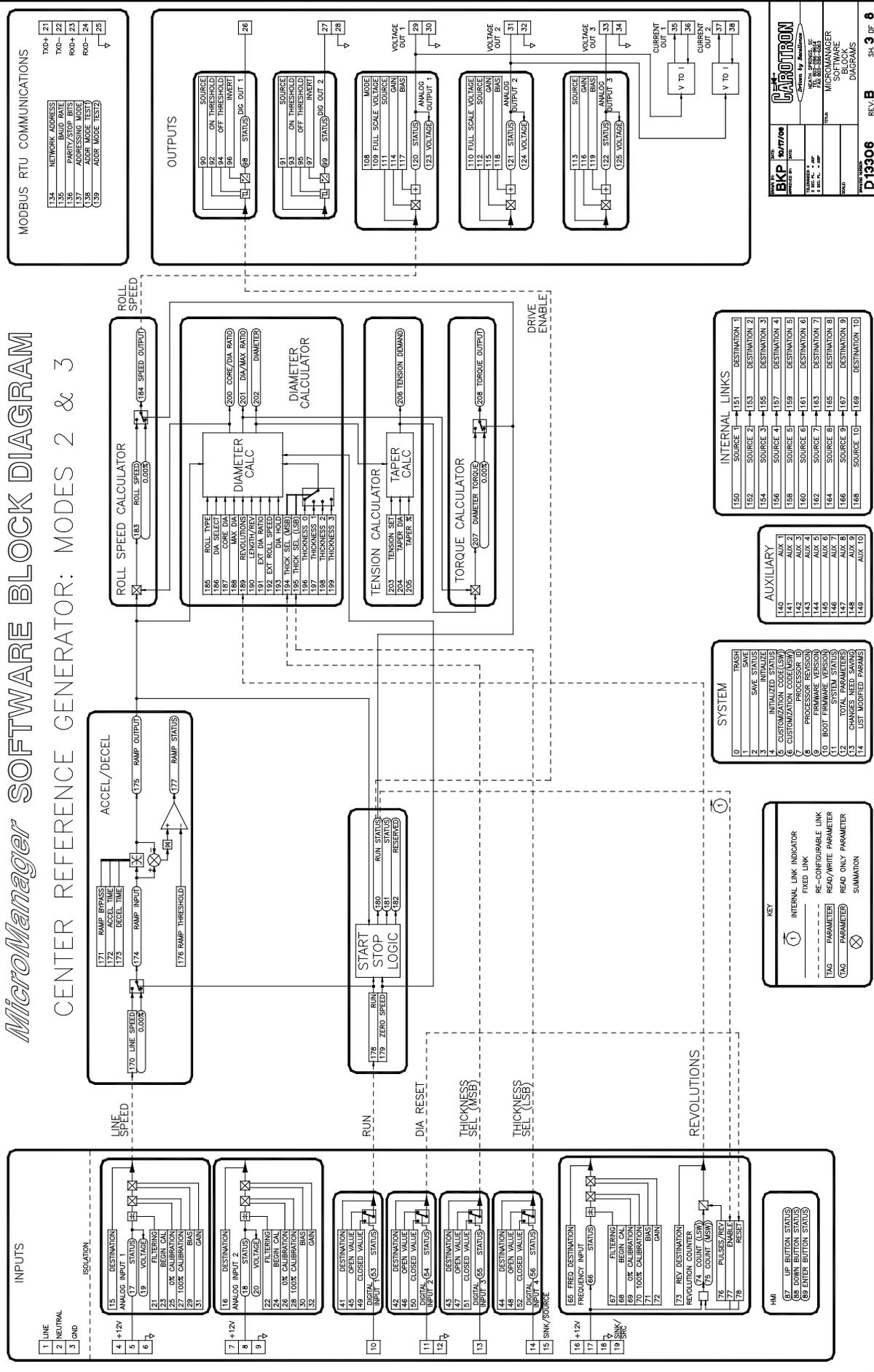
APPROVED BY: []
DATE: []

SOFTWARE MANAGER
BLOCK DIAGRAMS

REV. B SH. 2 OF 8

Micromanager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODES 2 & 3



MICROMANAGER
 SOFTWARE
 DIAGRAMS

REV B

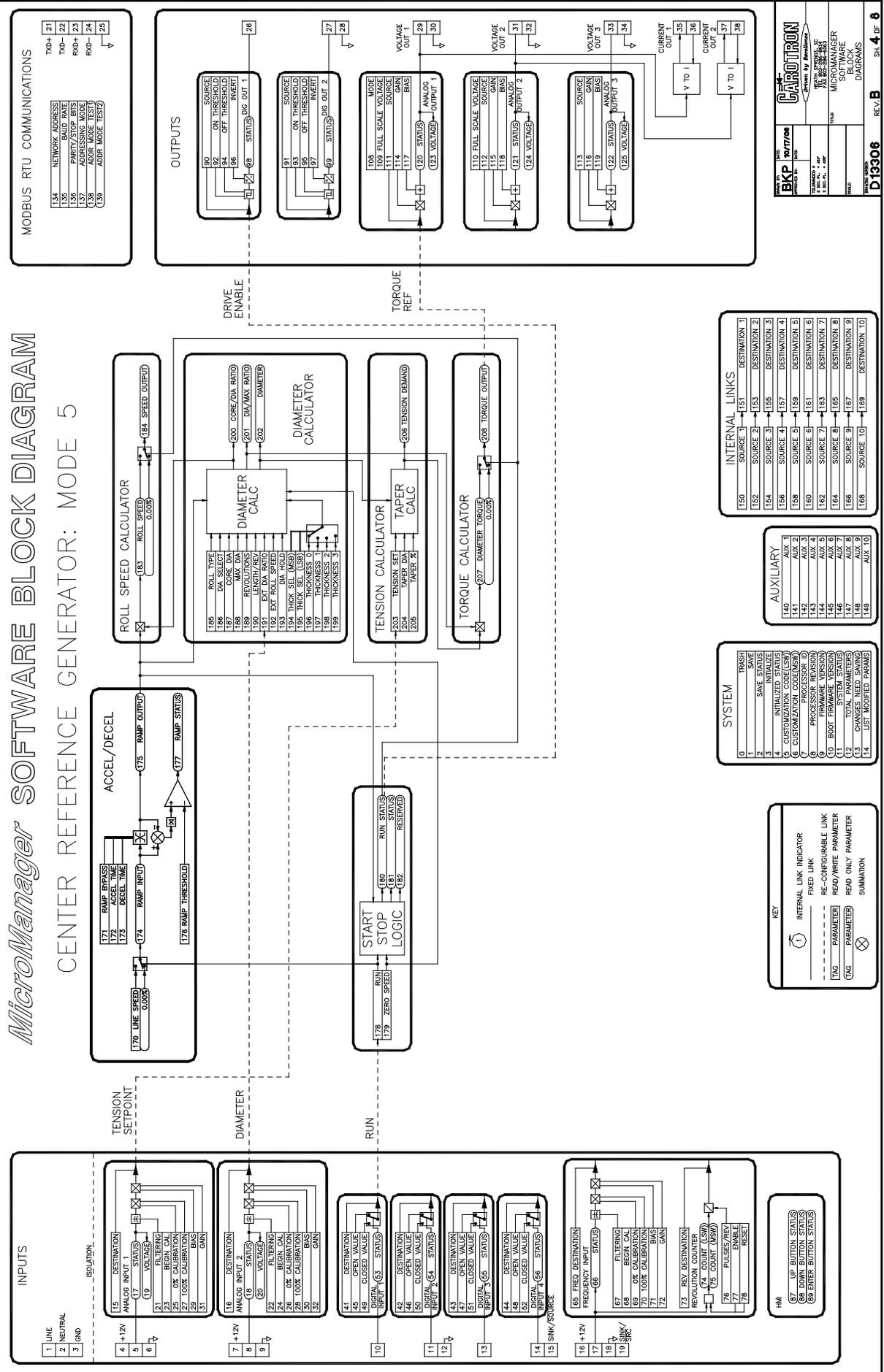
D19306

REV B

SH 3 OF 8

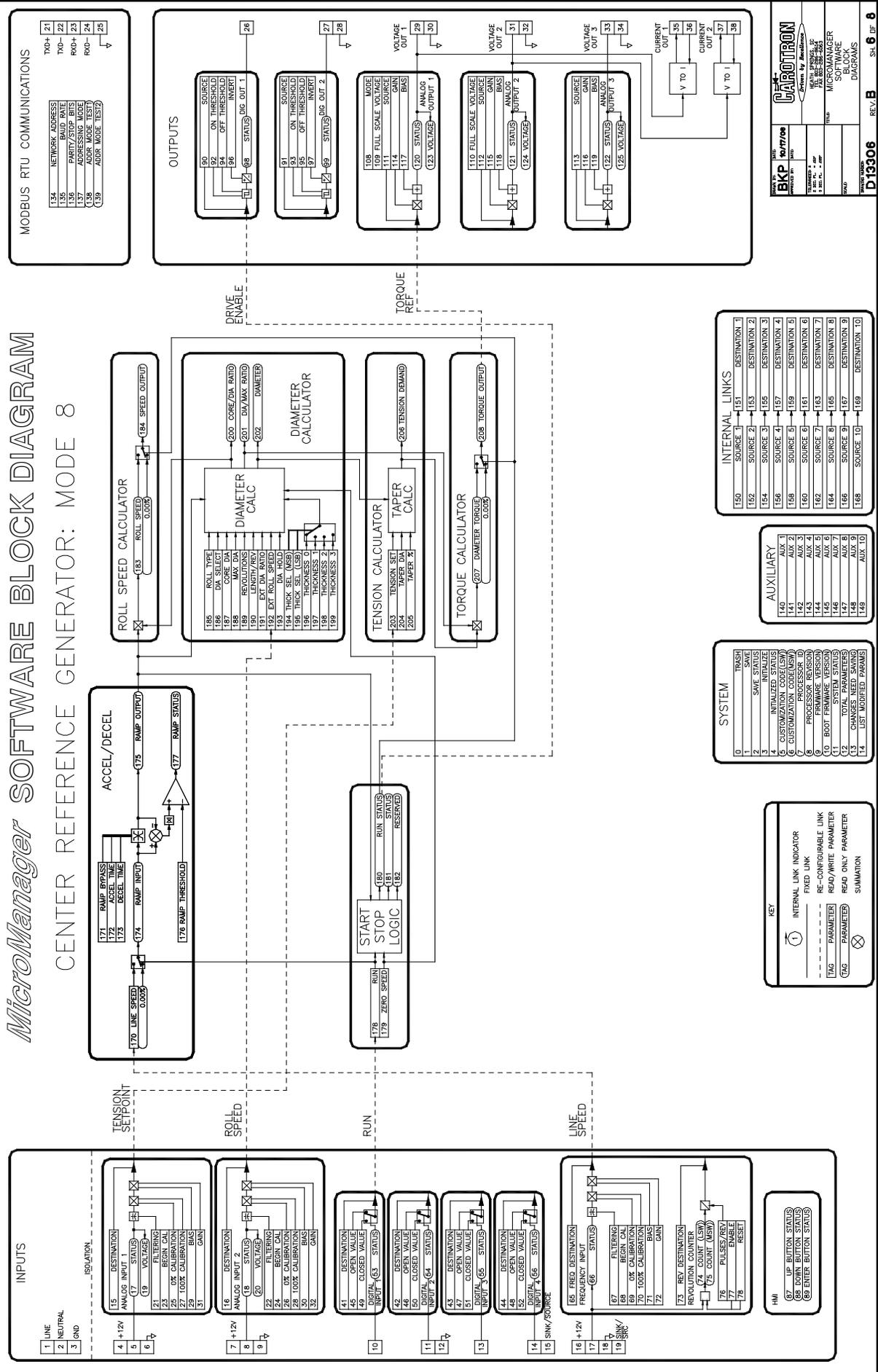
MicroManager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODE 5



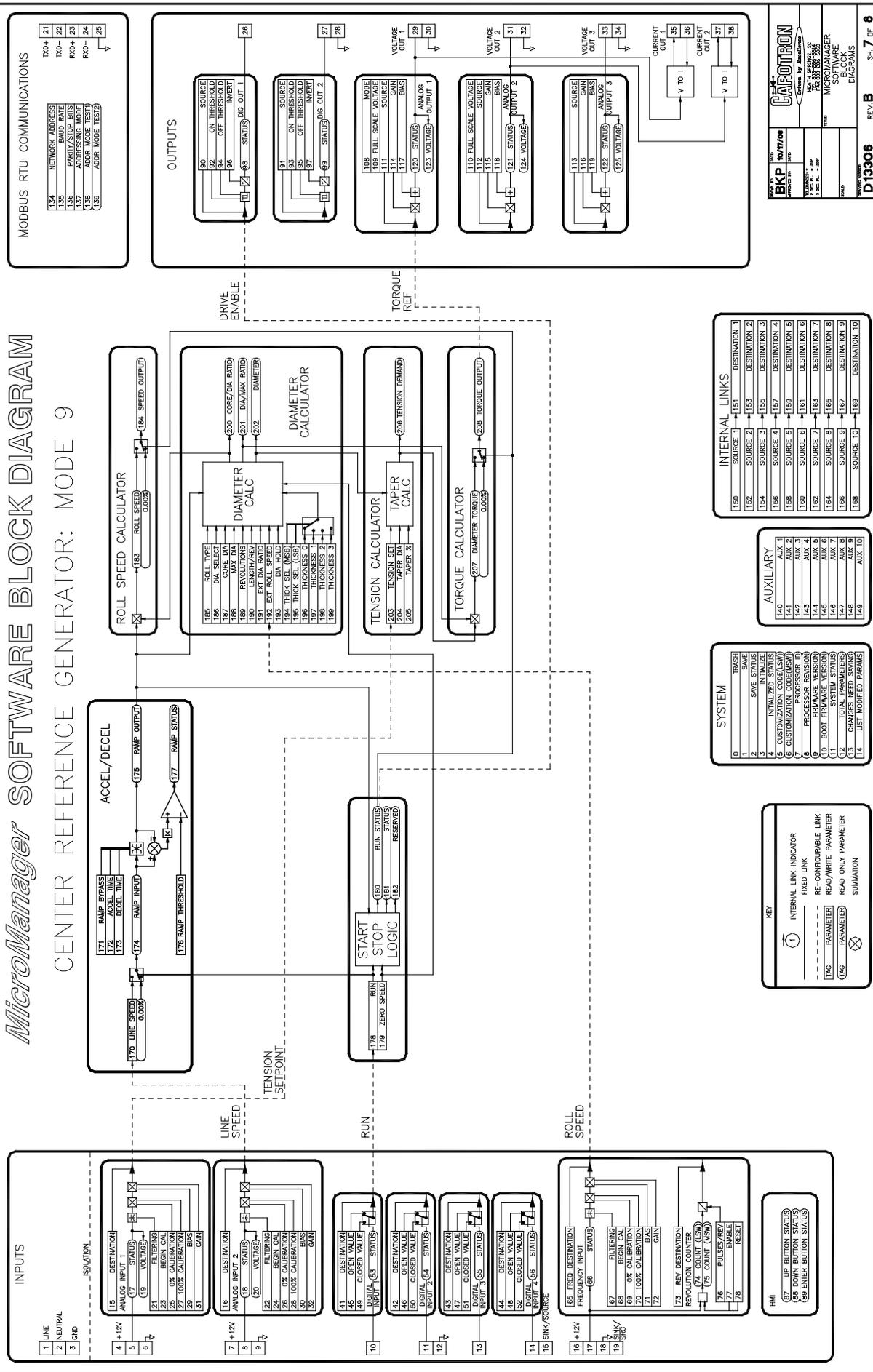
MicroManager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODE 8



Micromanager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODE 9



BKP **to/rtio**

REV. B SH. 7 OF 8

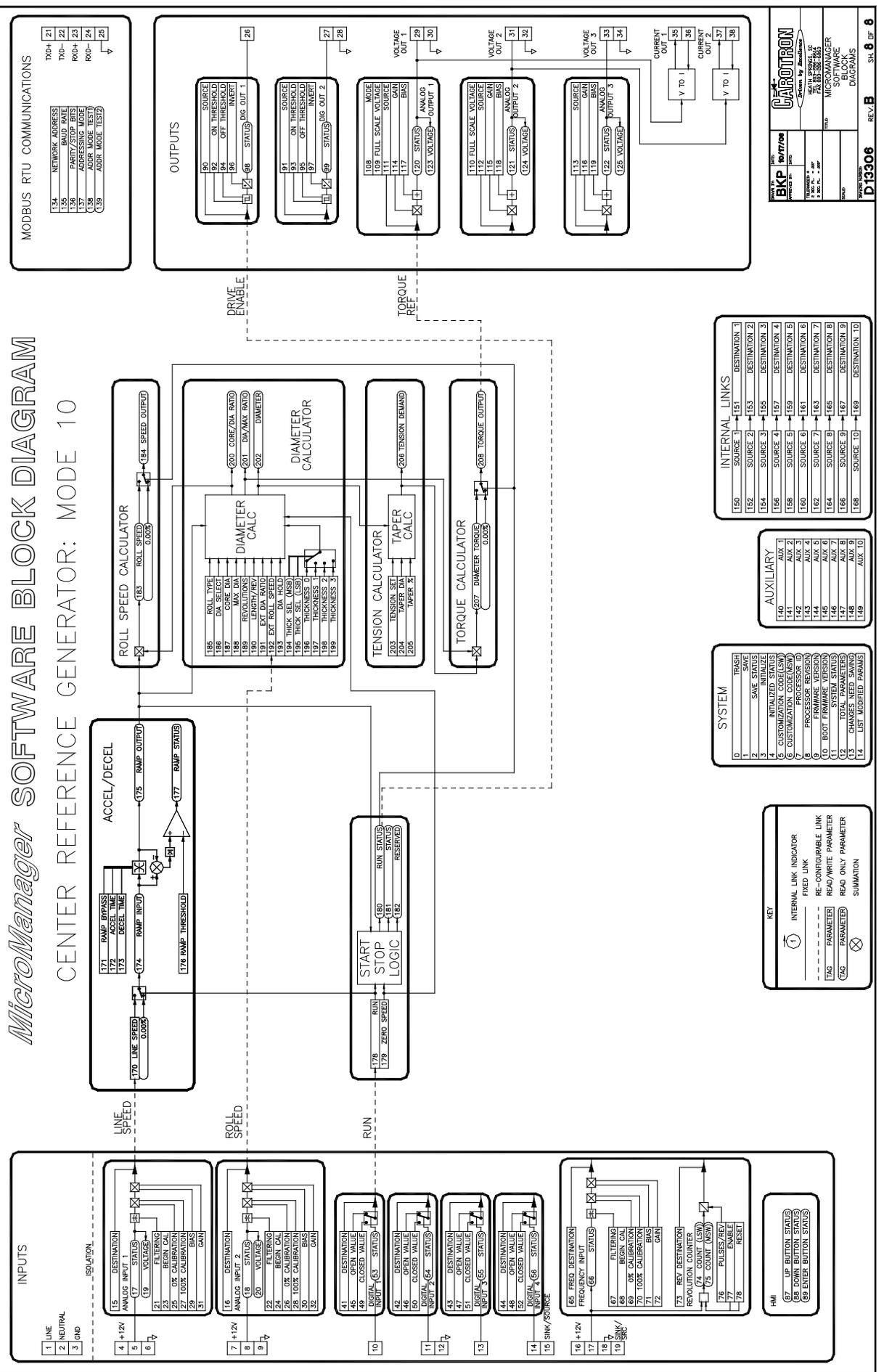
D13306

PARTRON

MicroManager SOFTWARE DIAGRAMS

Micromanager SOFTWARE BLOCK DIAGRAM

CENTER REFERENCE GENERATOR: MODE 10



Standard Terms & Conditions of Sale

1. General

The Standard Terms and Conditions of Sale of Carotron, Inc. (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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