CPW Current Programmed Winder for the 890.

Application Handbook

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WARNING

Only qualified personnel who thoroughly understand the operation of this equipment and any associated machinery should install, start-up, or attempt maintenance of this equipment. Non-compliance with this warning may result in serious personal injury and/or equipment damage.

Contents

Chapter 1 Introduction

CPW (Current Programmed Winder) is the solution to open-loop center winders to produce constant tension throughout the roll. The basic tension control provides:

- Torque proportional to diameter for constant web tension
- Compensations for static and dynamic friction losses
- Additional torque to accelerate or decelerate the machine and roll inertia

CPW provides the standard features required by a center winder including Diameter Calculation with diameter memory and preset, Tension and Taper, Over/Under Winding, etc. Additional features provide Stall Tension, Tension Boost, Web Break Detection, and a provision for an external closed loop trim. CPW can control unwinds or rewinds for single spindle and turret winders.

Other LINK solutions are available to meet other common application requirements and are documented by their individual manuals.

Chapter 2 Description

This section describes the operation of the functions in the CPW LINK function Block.

DIAMETER CALCULATOR

The roll diameter is calculated by dividing the LINE SPEED by the WINDER SPEED (diameter is always positive and independent of the polarity of the speeds). The LINE SPEED input should be the actual web speed from the previous section motor speed (the next section in the case of an unwind). The WINDER SPEED is the spindle motor speed.

Whenever the line is stopped, both the winder speed and line speed are zero. As a result, a preset diameter value (CORE 1, CORE 2 or EXT DIAMETER) is used on power up and when the PRESET ENABLE is TRUE. It will be the output value as long as the minimum speed is not exceeded. Above minimum speed, the calculated diameter is the output. If the line slows below the minimum speed, the last calculated diameter is used. It will continue to be the output diameter until the preset diameter is true.

BUILD UP is full roll (diameter = 100%) ÷ minimum diameter where minimum diameter is the calculated diameter at full (100%) line speed and full (100%) winder speed. MIN DIAMETER is a clamp.

The calculated DIAMETER output is filtered. The filter output tracks the diameter when TENSION ENABLE is TRUE and LINE SPEED is above MIN SPEED, otherwise the diameter is held at its current value.

WEB BREAK DETECTOR

The web break detector monitors the calculated diameter. If the calculated value changes in the wrong direction by more than the preset threshold (WB THRESHOLD), the detector provides a WEB BREAK output. The wrong direction is increasing diameter for an unwind or decreasing diameter for a rewind. For example, a rewind will speed up if the web breaks causing the calculated diameter to reduce. FORWARD-REVERSE refers to machine direction and reverses the function of the unwind or rewind like a Reversing Mill. WEB BREAK is reset when the TENSION ENABLE is disabled or by the WB RESET is TRUE.

SPEED DEMAND

A simple ramp in CPW uses the LINE SPEED SP or JOG SPEED to calculate the SPEED DEMAND. The ramp time is determined by the ramp delta, which is the percentage change per update. For example, if the LINE SPEED SP comes from the Master Ramp function block, the update is 100mS. Thus if the SPEED DELTA is set to 2%, the ramp output will change at 2% per 100mS and would take 5 seconds to change 100%.

Two ramp delta rates are provided: RUN DELTA and STOP DELTA. RUN DELTA is used if either Start or Jog is TRUE, otherwise STOP DELTA is used.

The ramped speed is summed with the OVERSPEED when the TENSION ENABLE is TRUE. OVERSPEED is positive for a rewind and negative for an unwind. It causes the speed loop to saturate when the web determines the speed. This enables the torque limits to control the tension. The ramped speed is scaled by BUILD UP and divided by the DIAMETER to produce the SPEED DEMAND to the drive that provides the correct surface speed at the roll.

The OVER-UNDER selection determines polarity of SPEED DEMAND; it is positive for over, when OVER-UNDER is TRUE.

A clamp limits the SPEED DEMAND output to 120%.

UP TO SPEED DETECTOR

The up to speed detector compares the actual line speed with the winder speed multiplied by diameter and scaled by BUILD UP. When they are the same, within the UTS THRESHOLD, the UP TO SPEED output goes TRUE.

TENSION DEMAND

The Tension Demand section modifies the tension setpoint for taper, tension boost, stall tension and a tension demand ramp.

Taper

The Tension Demand can be modified by one of two Taper profiles. Linear Taper linearly reduces the TENSION SP as the diameter increases. Hyperbolic Taper reduces the TENSION SP more quickly near the core and less as the diameter approaches the full roll.

Stall Tension

Stall tension is a reduced tension used when the line is stopped.

When STALL ENABLE is TRUE, the tension demand is STALL TENSION if STALL SELECT is Fixed, or STALL TENSION multiplied by the TENSION SP if STALL SELECT is Proportional. For example, if the TENSION SP is 80% and the STALL TENSION is 50%, then the tension demand at stall is 50% if the STALL SELECT is Fixed or 40% if Proportional.

Tension Boost

Tension boost increases the tension demand when BOOST ENABLE is TRUE. BOOST SELECT has Fixed and Proportional settings similar to Stall. The fixed or proportional boost is added to the TENSION SP.

Tension Demand Ramp

The Tension Demand Ramp has a TENSION DELTA that sets the rate. The delta is the output change per update where the update is the TENSION TICK TIME, which is normally set to 300mS. For example, if the TENSION DELTA is 10%, TENSION DEMAND can change 10% in 300mS. This setting would require three seconds for a 100% tension change.

Tension Demand and Dancer Loading

TENSION DEMAND is the output that goes to the CURRENT DEMAND section. Dancer Loading is not used for an open loop winder.

CURRENT DEMAND

TENSION DEMAND is multiplied by DIAMETER to produce the torque demand. Additional torque demands are added to compensate for inertia and friction. The total torque demand is modified above BASE SPEED to produce a CURRENT DEMAND that provides the drive current limit.

TENSION CAL can be adjusted to match the open loop control with the closed loop control. Normally it is set to 50% to keep the TORQUE DEMAND from saturating when the section is at full tension and at full roll.

TENSION TRIM is an input from an external tension loop trim of the open loop control.

TENSION SCALE is rarely used. It acts as a minimum taper limit when taper is used in TENSION DEMAND. Reduce its value to provide additional tension at core. TAPER must be increased proportionally to prevent the current demand from reaching 100% before full roll. The default setting for TENSION SCALE is 100%.

Inertia Compensation

The CPW function block calculates the torque required to accelerate the mechanical inertia. It is composed of two parts, fixed and variable inertia. The FIXED INERTIA is the inertia of the motor, gearbox and core. The VARIABLE INERTIA is the inertia of the roll and a WIDTH input is available for setting the web width. The total inertia (INERTIA COMP) is

multiplied by the scaled acceleration rate to produce the torque demand and the polarity is set by the REWIND/UNWIND selection.

Accelerating a rewind requires additional torque in the same direction as the tension producing torque whereas an unwind requires accelerating torque in the opposite direction to the tension torque. The Master Ramp function block supplies the acceleration rate and connects to the DERIVATIVE input. If the Master Ramp is not being used, the line speed can be connected to the DERIVATIVE SP input. The DERIVATIVE SP input is differentiated to produce a rate.

Loss Compensation

STATIC COMP is a fixed torque demand to compensate for the static friction or stiction.

DYNAMIC COMP is a torque demand proportional to winder speed to compensate for friction and windage. The torque polarity is set by the REWIND-UNWIND and FORWARD-REVERSE (which should only be used in the case of a reversing line) selections.

Field Range Compensation

When WINDER SPEED exceeds BASE SPEED the current demand is increased to compensate for the reduced field flux to maintain constant torque demand.

> NOTE. When using the 890 drive, the BASE SPEED parameter should be left at 100% even when an extended speed range is used.

Current Limits

The current demand polarity and positive or negative current limit is selected by the REWIND-UNWIND and OVER-UNDER selections. The POS CURRENT LIMIT and NEG CURRENT LIMIT outputs are connected to the current demand when the TENSION ENABLE is TRUE. Otherwise they are at the default 200%.

With the 890 drive, the positive and negative torque limits are used.

Chapter 3 Using CPW

BASICS

890 (AC Drive)

The CPW function block controls the positive and negative torque limits. SYMMETRIC TQ LIMIT must be false. Since torque is controlled directly, the BASE SPEED parameter is left at the 100% default, as additional compensation above base speed is not required. The Main Torque limit and the Current limit can be set as required.

Tension Enable

The CPW function block has two modes of operation for controlling twin-turret winders.

With the TENSION ENABLE disabled, the drive is speed controlled with the speed compensated by the roll diameter to provide the roll surface speed matched to line speed. This also provides jog with constant surface speed. In this mode the diameter can be preset. It is used when the web is not connected to the winder.

When the TENSION ENABLE is enabled, the drive is torque controlled and the web limits the winder speed. The diameter is calculated as the roll builds up (or builds down for an unwind).

QUICK SET UP

The following section covers a basic single-spindle rewind. It requires the user to have DSD or ConfigEd configuration software to program the CPW function block and make the connections to the drive as part of a LINK network.

Connections

See drawing RF354823 in this document, for connections and the detailed block diagram.

Inputs

Line Speed SP	From the Master Ramp Output
Line Speed	Should be the actual web speed from the previous section motor speed (or the next section for an unwind)
Winder Speed	Spindle motor speed
Rate	From the Master Ramp Rate Output
Tension Enable	See Start below
Preset Enable	Used to reset the diameter to core (from pushbutton)
Tension SP	From the Tension potentiometer
Taper SP	From the Taper potentiometer

Use the Drive Start Logic, DSL2, to interface Run commands with the drive. This table shows the required connections.

Start	Connect the **Start** and **Stop**, and **Ready** from the drive to DSL2 inputs. Connect the Latch output of the DSL2 to the START and TENSION ENABLE inputs on the CPW. Connect the DSL2 output to the drive START. --- **or** if individual **start** and **stop** are not used --- Connect **Run**, from the Master Ramp output, to the M START 2 input of the DSL2 and to the START and TENSION ENABLE inputs of the CPW
Jog	If required, connect the **Jog** to both a M START input on the DSL2 and to the JOG input on the CPW

Outputs

Speed Demand	890 – Speed Setpoint
POS CURRENT LIMIT	890 – Pos I/T Limit
NEG CURRENT LIMIT	890 – Neg I/T Limit

Parameters

Build Up	Full Roll Diameter ÷ Core Diameter × 100% (for 60” full roll and 6” core, Build Up = 10)
Min Diameter	Core Diameter ÷ Full Roll Diameter × 100% (for 60” full roll and 6” core, Min Diameter = 10%)
Core 1	Core Diameter ÷ Full Roll Diameter × 100% (for 60” full roll and 6” core, Core 1 = 10%)

Note. All other parameters should be at default values.

Running Checks

This requires the software DSE890 or DSE 890 Lite to set and monitor the CPW function block and the drive.

1. Check that the winder is safe to run and that E-stop is reset.
2. Fit an empty core onto the winder. Do NOT splice a web onto the core or start the line.
3. Verify that DIAMETER in CPW is at core, the diameter preset. Set TENSION SP to 100%. TENSION ENABLE should be disabled.
4. Start the winder in JOG. The winder should run at 5% speed in the correct direction. If the direction is wrong, change OVER-UNDER to Under.
5. Change the JOG SPEED to 50%. Check the core surface speed, it should be at 50% of maximum rated web speed. Adjust the speed, if required, using the Tach or Encoder Cal in the drive as appropriate.
6. Use Start to enable the Tension Enable while maintaining the Jog. The speed should increase by 10% and the drive positive limit (over) or negative limit (under) should be controlled by the TENSION SP.
7. Monitor the DIAMETER and reduce the TENSION SP so that the winder slows down. The diameter should increase to 100%.
8. Remove the JOG, TENSION ENABLE and START; the drive should switch off.
9. Enable the PRESET ENABLE. The DIAMETER should be preset to core.
10. Set the JOG SPEED back to 5%.

This completes the Quick Set-Up. The winder will now control tension but the accuracy will be limited until the loss and inertia compensations are set.

Setting Inertia Compensation Using Speed Control

For this method of measuring the inertia compensation the drive is run independently of the CPW tension control. The drive is run in speed control using the drive ramp to control acceleration and deceleration. Typically the drive will be started and the speed demand to the ramp, set via the software DSE 890 in the On Line Mode.

Note. Where load is specified, read torque demand.

Note. Where base speed is specified, this is the actual base speed (% of max speed) at the calibrated maximum volts, not necessarily the motor nameplate base speed. This is the same as the BASE SPEED parameter in CPW.

Inertia Compensations

Determine the fastest Master Ramp ramp time for the machine that maintains tension control. For example, if the run time is 30 seconds and the stop time is 20 seconds, use 20 seconds; ignore the E-stop settings.

Set the DERIVATIVE CAL in CPW to 20% ÷ Ramp time. This is a calibration setting and still permits the Master Ramp times to be reduced (up to 25%) or increased (no limit). For example, if the fastest specified ramp time is 20 seconds, set DERIVATIVE CAL to 20% ÷ 20 = 1%.

Fixed Inertia

1. Install a core.
2. Set the drive ramp time, accel and decel to the time used for the DERIVATIVE CAL above.

Without a Field Range

3. Start the drive at 1% speed and record the load and then set ramp speed demand to 100%. Read the change in load during acceleration. At full speed the load should return to a steady value; record the load.
4. Set the ramp speed demand back to 1% and read the deceleration load change. The load at 1% speed should return to the same as recorded above.
5. The acceleration and deceleration load changes should be equal and opposite. This value is the FIXED INERTIA compensation.

   For example, the load at 1% speed = 0.5% and the load at 100% speed = 2%. When accelerating the load starts at 4% and increases to 5.5% just before full speed. This is 3.5% change. Decelerating the load starts at -1.5% and decreases to -3.0% just before zero speed. This is a 3.5% change. The average of the acceleration and deceleration load is the value for FIXED INERTIA.

With a Field Range

6. The procedure is exactly the same as without a field range, above, except the high speed demand must be limited to base speed (preferably just below).

   For example, the load at 1% speed = 0.5% and the load at base speed = 2%. When accelerating the load starts at 4% and increases to 5.5% just before base speed. This is 3.5% change. Decelerating the load starts at -1.5% and decreases to -3.0% just before zero speed. This is a 3.5% change. The average of the acceleration and deceleration load is the value for FIXED INERTIA.

Variable Inertia

Determine the roll build up ratio. This is the maximum full roll diameter divided by the core diameter. The build up must modify the ramp rates and speed demand. The ramp time is multiplied by the build up and the speed demand divided by the build up.

For this example the Core OD = 6", the Full Roll diameter = 48"and the Ramp Time = 20 sec.

The build up is 48/6 = 8.

The drive accel and decel ramp time is set to 20 × 8 = 160sec.

The high speed demand is 100 ÷ 8 = 12.5%. This speed will be equal to or less than base speed so no special procedure is required for a field range.

1. Fit a full roll or as near a full roll as possible (not larger). Measure the actual size; for the correction factor for less than full roll, see later section.
2. Start the drive at 1% speed, then set ramp speed demand to value calculated above. Read the change in load during acceleration. Set the ramp speed demand back to 1% and read the change in load during deceleration. Take the average of the accel/decel load change values similarly to the FIXED INERTIA procedure.
3. Subtract the FIXED INERTIA component from the full roll accel/decel load change and then correct for the roll size.

$$\text{VARIABLE INERTIA} = (\text{load change value from Step 2} - (\text{Fixed Inertia} \div \text{Build up})) \times (100\% \div \text{Roll Size\%})^3$$

The following example has a build up = 8, fixed inertia = 3.5% and roll size = 90% of a full roll. The measured load change is 12%.

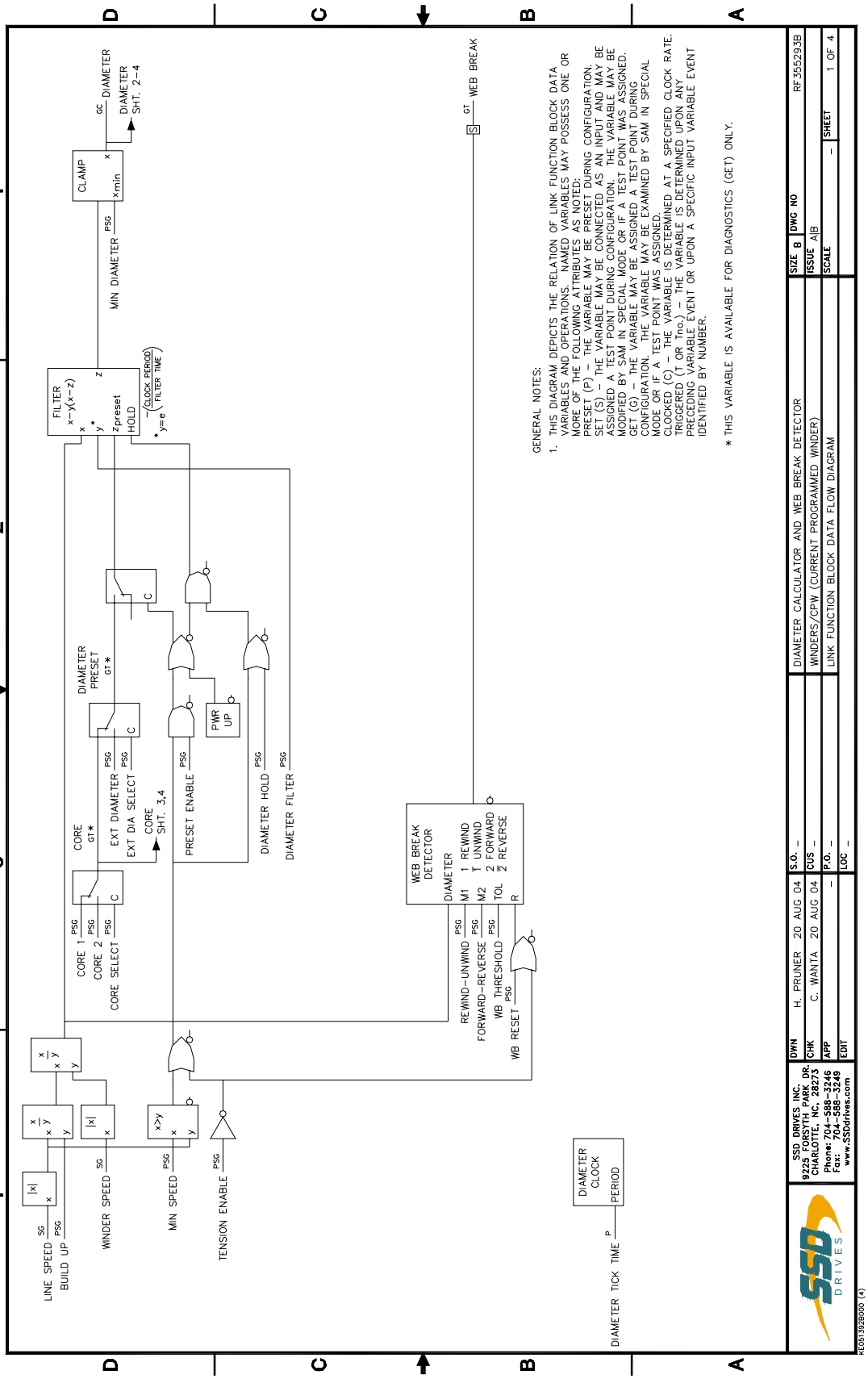
$$\text{VARIABLE INERTIA} = (12 - (3.5 \div 8)) \times (100\% \div 90\%)^3 = 15.86\%$$

Use this value for CPW VARIABLE INERTIA.

If the winder uses a gearbox with multiple ratios or uses one or two motors, it will be necessary to measure the compensations for each motor and gearbox ratio combination. The different compensations must be switched into the CPW for each combination.

Chapter 4 Function Block Diagram

This chapter contains the software block diagrams for the CPW function Block. Diagrams are printed on the following pages 4-2 through 4-5.


LINE SPEED
BUILD UP
WINDER SPEED
MIN SPEED
TENSION ENABLE
DIAMETER TICK TIME
DIAMETER CLOCK
PERIOD
CORE 1
CORE 2
CORE SELECT
CORE
GT*
EXT DIAMETER
EXT DIA SELECT
CORE
SHT. 3,4
DIAMETER
PRESET
GT*
PRESET ENABLE
PWR
UP
DIAMETER HOLD
DIAMETER FILTER
FILTER
x-y(x-z)
preset
HOLD
(CLOCK PERIOD)
FILTER TIME
CLAMP
xmin
MIN DIAMETER
DIAMETER
SHT. 2-4
WEB BREAK
WEB BREAK
DETECTOR
DIAMETER
REWIND
UNWIND
FORWARD
REVERSE
REWIND-UNWIND
FORWARD-REVERSE
WB THRESHOLD
WB RESET
GENERAL NOTES:
1. THIS DIAGRAM DEPICTS THE RELATION OF LINK FUNCTION BLOCK DATA VARIABLES AND OPERATIONS. NAMED VARIABLES MAY POSSESS ONE OR MORE OF THE FOLLOWING ATTRIBUTES AS NOTED:
PRESET (P) – THE VARIABLE MAY BE PRESET DURING CONFIGURATION.
SET (S) – THE VARIABLE MAY BE CONNECTED AS AN INPUT AND MAY BE ASSIGNED A TEST POINT DURING CONFIGURATION. THE VARIABLE MAY BE MODIFIED BY SAM IN SPECIAL MODE OR IF A TEST POINT WAS ASSIGNED.
GET (G) – THE VARIABLE MAY BE ASSIGNED A TEST POINT DURING CONFIGURATION. THE VARIABLE MAY BE EXAMINED BY SAM IN SPECIAL MODE OR IF A TEST POINT WAS ASSIGNED.
CLOCKED (C) – THE VARIABLE IS DETERMINED AT A SPECIFIED CLOCK RATE.
TRIGGERED (T OR Tno.) – THE VARIABLE IS DETERMINED UPON ANY PRECEDING VARIABLE EVENT OR UPON A SPECIFIC INPUT VARIABLE EVENT IDENTIFIED BY NUMBER.
* THIS VARIABLE IS AVAILABLE FOR DIAGNOSTICS (GET) ONLY.
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Fax: 704-588-3249
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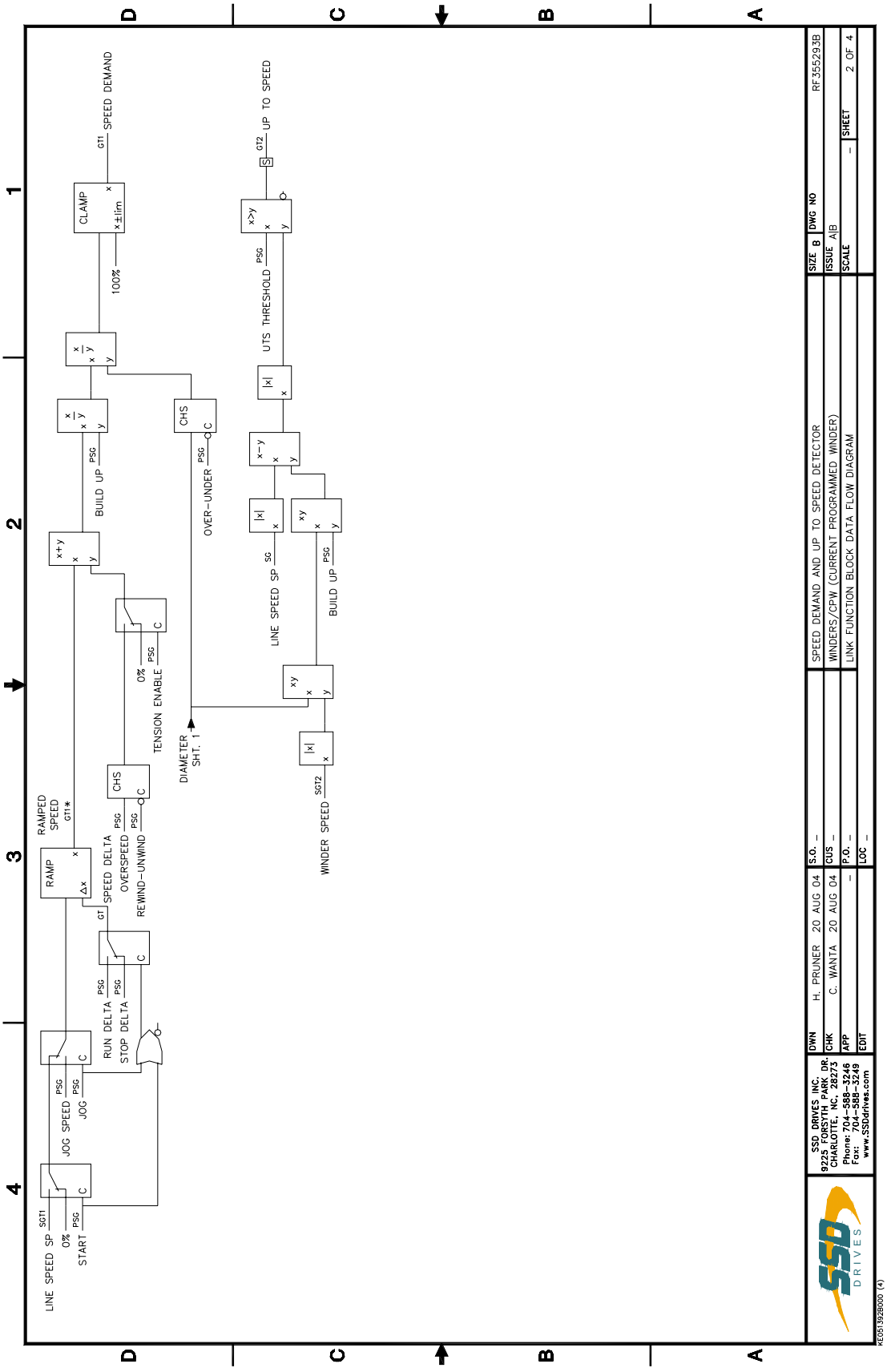
DWN H. PRUNER 20 AUG 04
CHK C. WANTA 20 AUG 04
APP –
EDIT –
S.O. –
CUS –
P.O. –
LOC –
DIAMETER CALCULATOR AND WEB BREAK DETECTOR
WINDERS/CPW (CURRENT PROGRAMMED WINDER)
LINK FUNCTION BLOCK DATA FLOW DIAGRAM
SIZE B
DWG NO
RF35529JB
ISSUE A1B
SCALE –
SHEET 1 OF 4
KED51939B00 (4)


SPEED DEMAND AND UP TO SPEED DETECTOR
WINDERS/CPW (CURRENT PROGRAMMED WINDER)
LINK FUNCTION BLOCK DATA FLOW DIAGRAM
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DWN H. PRUNER 20 AUG 04
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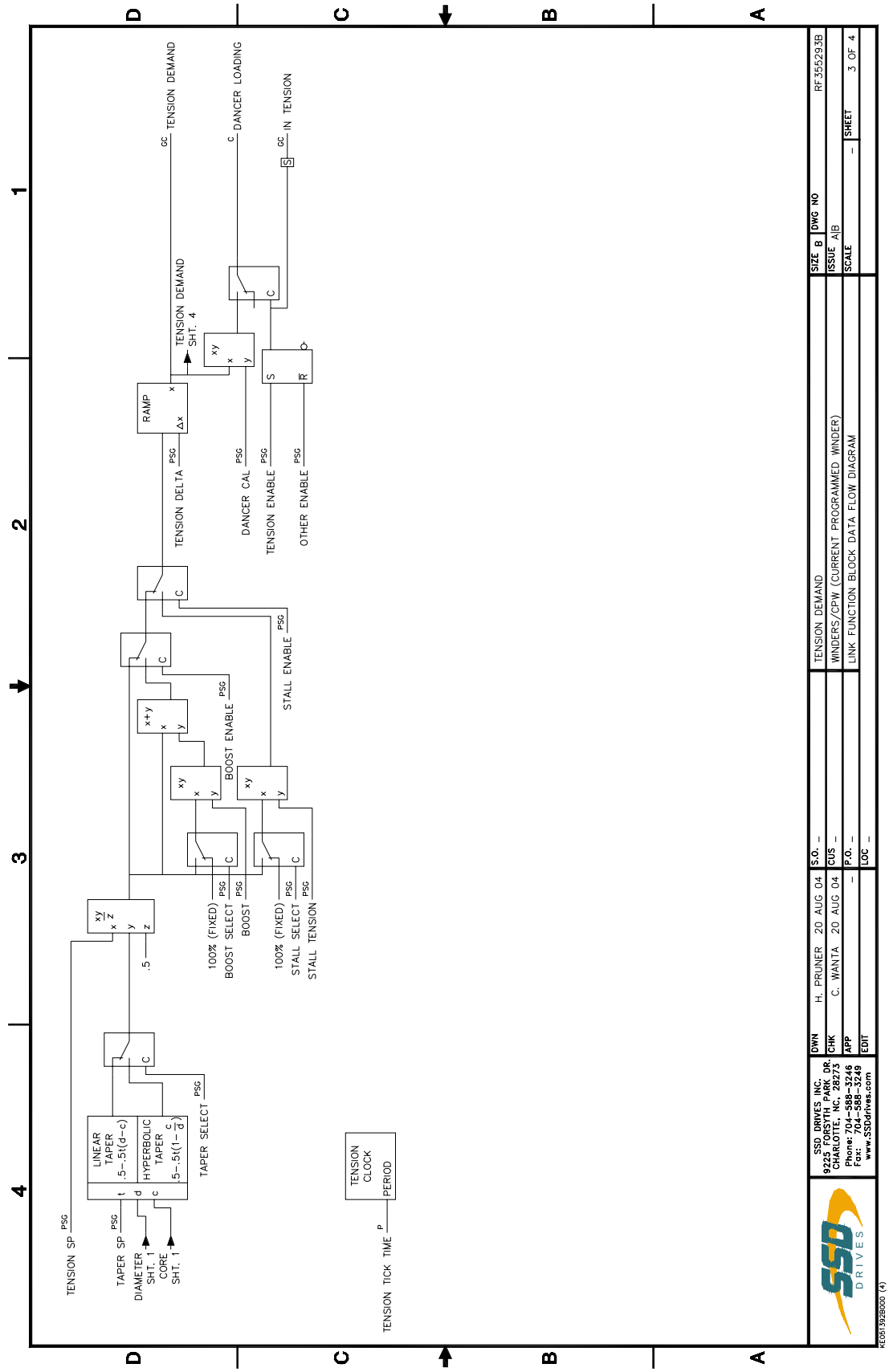
APP
EDIT
S.O. –
CUS –
P.O. –
LOC –
SIZE B
DWG NO RF35529JB
ISSUE A|B
SCALE –
SHEET 2 OF 4
KE0513928000 (4)
LINE SPEED SP
0%
START
JOG SPEED
JOG
RUN DELTA
STOP DELTA
RAMP
RAMPED SPEED
SPEED DELTA
OVERSPEED
REWIND–UNWIND
TENSION ENABLE
BUILD UP
CLAMP
100%
SPEED DEMAND
DIAMETER SHT. 1
OVER–UNDER
LINE SPEED SP
BUILD UP
WINDER SPEED
UTS THRESHOLD
UP TO SPEED


TENSION DEMAND
DANCER LOADING
IN TENSION
TENSION DEMAND SHT. 4
RAMP
TENSION DELTA
DANCER CAL
TENSION ENABLE
OTHER ENABLE
STALL ENABLE
BOOST ENABLE
100% (FIXED)
BOOST SELECT
BOOST
100% (FIXED)
STALL SELECT
STALL TENSION
TAPER SELECT
LINEAR TAPER
HYPERBOLIC TAPER
TENSION SP
TAPER SP
DIAMETER SHT. 1
CORE SHT. 1
TENSION CLOCK PERIOD
TENSION TICK TIME
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APP
EDIT
S.O. –
CUS –
P.O. –
LOC –
TENSION DEMAND
WINDERS/CPW (CURRENT PROGRAMMED WINDER)
LINK FUNCTION BLOCK DATA FLOW DIAGRAM
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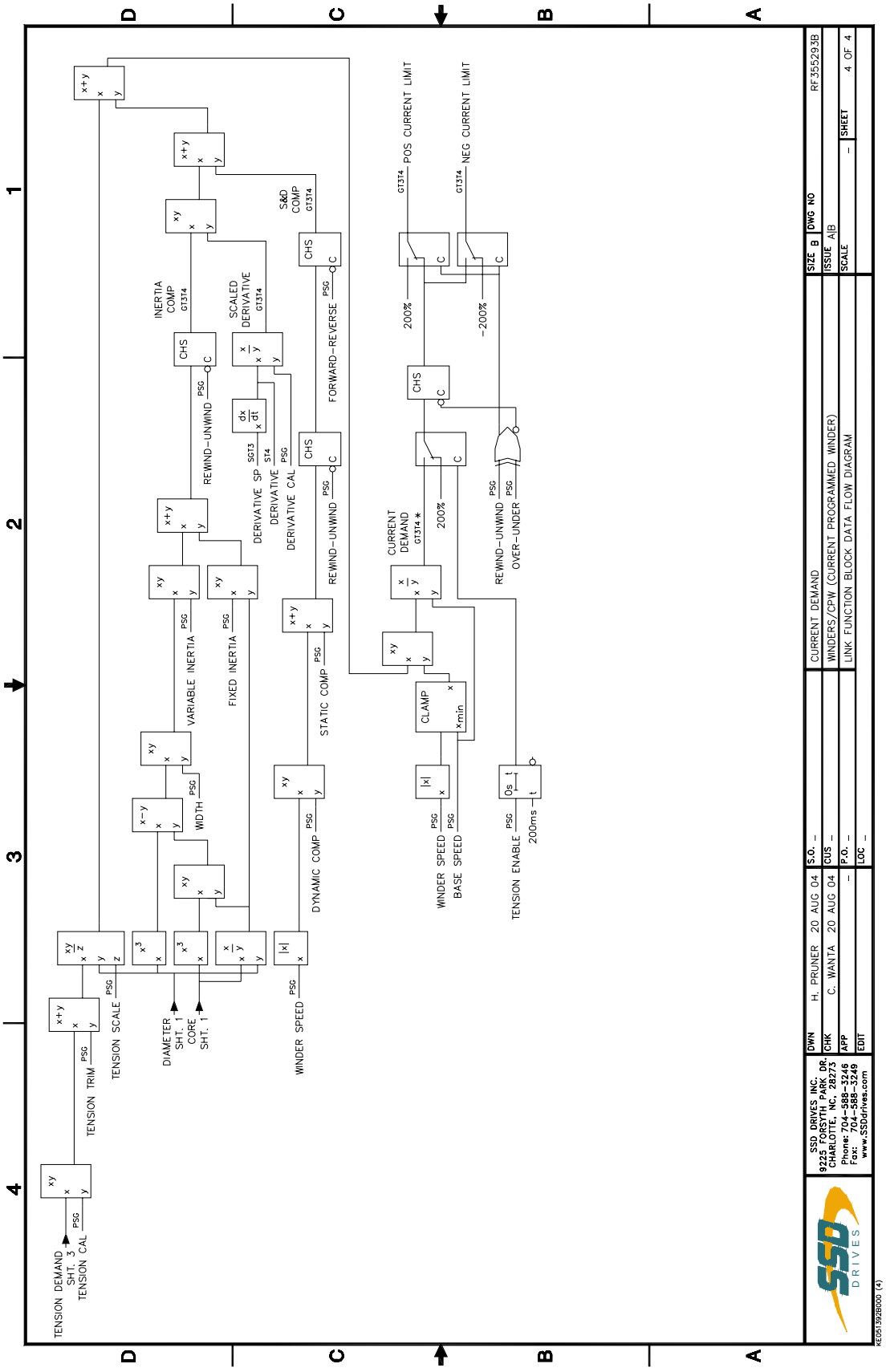
DWG NO RF35529-3B
ISSUE A1B
SCALE –
SHEET 3 OF 4
KED51939B000 (4)


TENSION DEMAND SHT. 3
TENSION CAL
TENSION TRIM
TENSION SCALE
DIAMETER SHT. 1
CORE SHT. 1
WINDER SPEED
DYNAMIC COMP
STATIC COMP
REWIND-UNWIND
FORWARD-REVERSE
DERIVATIVE SP
DERIVATIVE
DERIVATIVE CAL
SCALED DERIVATIVE
S&D COMP
INERTIA COMP
REWIND-UNWIND
VARIABLE INERTIA
FIXED INERTIA
WIDTH
CURRENT DEMAND
200%
POS CURRENT LIMIT
NEG CURRENT LIMIT
-200%
WINDER SPEED
BASE SPEED
REWIND-UNWIND
OVER-UNDER
TENSION ENABLE
200ms
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CUS _
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LOC _
CURRENT DEMAND
WINDERS/CPW (CURRENT PROGRAMMED WINDER)
LINK FUNCTION BLOCK DATA FLOW DIAGRAM
SIZE B
DWG NO RF35529JB
ISSUE A|B
SCALE –
SHEET 4 OF 4
KE0513928000 (4)

Appendix A Rate Calibration

Inertia Compensation – Derivative

The RATE output from the Master Ramp is an absolute value. It is defined where 100% = 0.1 sec ramp time, 10% = 1 sec, 1% = 10 sec, and 0.1% = 100 sec, etc. RATE is connected to the DERIVATIVE input in CPW.

The DERIVATIVE CAL, of 20% ÷ (Fastest Ramp Time in Sec), is a divisor to produce a SCALED DERIVATIVE of 50% at the nominal ramp rate. Since 50% in LINK equals 100% current, the INERTIA COMP, fixed or variable, is set directly in actual percent motor current.

With the DERIVATIVE CAL set for a SCALED DERIVATIVE of 50% at the nominal minimum ramp time, the SCALED DERIVATIVE will not saturate until the ramp time is less than half the nominal and will be correct for any longer ramp times.

Also, remember if "S" is used, the linear portion of the ramp is actually at a higher ramp rate than the overall ramp time.

Derivative SP

When using the DERIVATIVE SP, the DERIVATIVE CAL will be 20% ÷ Ramp Time (in Sec) if the DERIVATIVE SP full speed is 100%.

NOTE. If full speed is 83.3% (standard LINK calibration), then the DERIVATIVE CAL will be 16.66% ÷ (Fastest Ramp Time in Sec).

Appendix B Parameter List

Parameter	Description	Default
	Diameter Calculator - Main Parameters	
Min Diameter	Minimum value of Diameter Calculator output. Full diameter = 100% Min = 100%/Build Up	10%
Diameter Filter	Diameter Filter value = $e^{-\text{Tick Time/Filter Time}}$ (if Tick Time = 300ms and Filter Time = 5 seconds, then Filter value = 0.94).	0.94
Diameter Hold	Initial condition of Diameter Filter.	Track
Preset Enable	Initial condition of Diameter Preset. Preset loads value of Core or External Diameter into Diameter Filter.	Disabled
Min Speed	Line Speed value below which Diameter is held.	5%
Build Up	Ratio of Full Roll Diameter to Core Diameter.	10
Diameter Tick Time	Clock period for Diameter calculation. Filter Time is proportional to Tick Time.	300 ms
	Diameter Calculator - Web Break Parameters	
WB Threshold	Internal accumulator threshold value to detect a web break. Represented as a % of full roll diameter.	10%
Rewind-Unwind	Selects application for Rewinding or Unwinding. Rewind = true, Unwind = false. See Forward-Reverse.	Rewind
Forward-Reverse	Initial condition of line Direction. Only used in reversing lines. In Reverse, unwind becomes rewind and rewind becomes unwind. Forward = true, Reverse = false.	Forward
WB Reset	Initial condition of Web Break Counter Reset.	Disabled
Tension Enable	Initial condition of Tension Enable.	Disabled

	Diameter Calculator - Core Parameters	
Ext Diameter	Initial value of External Diameter input (% Full roll).	100%
Ext Dia Select	Selects source of Diameter Preset (see Preset Enable).	Core

Core 1	Value of Core 1 (% Full roll).	10%
Core 2	Value of Core 2 (% Full roll).	20%
Core Select	Initial core selection (Core 1 = false, Core 2 = true).	Core 1
	Speed Demand - Main Parameters	
Run Delta	Run Ramp increment per Tick Time (Speed Demand Tick determined by update rate of Line Speed SP input, typically 100ms). 2% in 100ms = Ramp time to 100% of 5 seconds.	2%
Stop Delta	Stop Ramp increment, when Start and Jog are Disabled (see Run Delta above).	2%
Jog Speed	Value of Jog Speed	5%
Start	Initial condition of Start input	Disabled
Jog	Initial condition of Jog input	Disabled
Overspeed	Overspeed value added to Speed Demand in Tension mode.	5%
	Tension Demand - Main Parameters	
Tension Tick Time	Clock period for Tension Demand calculation.	300 ms
Stall Tension	Tension value when Stall Enabled.	50%
Stall Select	Stall value - "Fixed" = Stall Tension, "Proportional" = Stall Tension * Set Tension.	Proportional
Stall Enable	Initial condition of Stall Enable	Disabled
Boost	Boost value when Boost Enabled.	0%

Boost Select	Boost value - "Fixed" = Boost, "Proportional" = Boost * Set Tension.	Proportional
Boost Enable	Initial condition of Boost Enable.	Disabled
Tension SP	Initial value of Tension Setpoint.	0%
Taper SP	Initial value of Taper Setpoint.	0%
Taper Select	Selects "Linear" or "Hyperbolic" Taper profile.	Linear

	Tension Demand - Output Parameters	
Dancer Cal	Scaling of output for Dancer Loading (note: not normally used in CPW with no dancer).	100%
Tension Delta	Tension Ramp increment per Tension Tick Time. For Tension Tick Time of 300 ms and Tension Delta of 33.3%, 100% ramp time = 1 second.	30%
	Current Demand - Main Parameters	
Over-Under	Selects Winding Direction. Also used for direction of Jog for payout and takeup.	Over
Derivative Cal	Calibration of the Derivative input signal to provide the scaled derivative for Inertia Compensation. Where the rate signal from the Master Ramp function block is used as the derivative input, the Derivative Cal should be set at 0.2/Ramp Time in seconds to provide a scaled derivative of 50% (see Inertia Parameters below).	100%
	Current Demand - Inertia Parameters	
Fixed Inertia	This parameter calibrates the torque required to accelerate and decelerate the Fixed Inertia of the motor and mechanics. With the derivative Cal set as above, the Fixed Inertia value should be set to the % Full Load Current required to accelerate the empty core at the specified ramp rate.	0%

Variable Inertia	This parameter calibrates the torque required to accelerate and decelerate the roll. With the derivative Cal set as above, the Variable Inertia value should be set to the % Full Load Current required to accelerate the full roll at the specified ramp rate.	0%
Width	Initial value of Roll Width	100%

	Current Demand - Winder Parameters	
Base Speed	This parameter compensates for a field weakening range. Base Speed is % of Full Speed.	100%
Static Comp	Parameter for Static or Stiction Compensation. Compensation is Constant. Value is % motor Full Load Current.	0%
Dynamic Comp	Parameter for Dynamic or Friction Compensation. Compensation is proportional to speed. Value is % motor Full Load Current at full speed.	0%
	Current Demand - Tension Parameters	
Tension Scale	Divisor to permit Tension Calibration of greater then 100%.	100%
Tension Trim	Initial value for Trim input.	0%
Tension Cal	Tension Calibration - normally 50% to provide 100% motor Full Load Current for 100% tension demand at full roll.	50%
	Miscellaneous Parameters	
UTS Threshold	Up to Speed Threshold. Up to Speed Output is true when Winder Surface Speed is within Threshold of Line Speed.	5%
Other Enable	Disconnects Dancer Loading output when other spindle Tension is Enabled (note: not normally used in CPW with no dancer).	Disabled

Operation	Description
Base Speed	Current Demand input. Expects a value between -100% and 100%.
Boost	Tension Demand input. Expects a value between -100% and 100%.
Boost Enable	Tension Demand input. Expects Proportional (true) or Fixed (false).
Boost Select	Tension Demand input. Expects Enabled (true) or Disabled (false).
Build Up	General Input. Expects a value between 1 and 20.
Core 1	Diameter Calc. input. Expects a value 0.1% to 100% Full Roll.
Core 2	Diameter Calc. input. Expects a value 0.1% to 100% Full Roll.
Core Select	Diameter Calc. input. Expects Core 2 (true) or Core 1 (false).
Dancer Cal	Tension Demand input. Expects a value between -100% and 100%.
Derivative Cal	Current Demand input. Expects a value between -100% and 100%.
Derivative SP	Current Demand input. Expects a value between -120% and 120%.
Derivative	Current Demand input. Expects a value between -1.0 and 1.0.
Diameter Filter	Diameter Calc. input. Expects a value between 0 and 1.0.
Diameter Hold	Diameter Calc. input. Expects Hold (true) or Track (false).
Dynamic Comp	Current Demand input. Expects a value between -100% and 100%.
Ext Dia Select	Diameter Calc. input. Expects External (true) or Core (false).
Ext Diameter	Diameter Calc. input. Expects a value 0.1% to 100% Full Roll.
Fixed Inertia	Current Demand input. Expects a value between -100% and 100%.
Forward-Reverse	Diameter Calc. input. Expects Forward (true) or Reverse (false).
Jog	Speed Demand input. Expects Enabled (true) or Disabled (false).
Jog Speed	Speed Demand input. Expects a value between -120% and 120%.
Line Speed	Diameter Calc. input. Expects a value between -120% and 120%.
Line Speed SP	Speed Demand input. Expects a value between -120% and 120%.
Min Diameter	Diameter Calc. input. Expects a value 0.1% to 100% Full Roll.
Min Speed	Diameter Calc. input. Expects a value between -120% and 120%.
Other Enable	Tension Demand input. Expects Enabled (true) or Disabled (false).

Over-Under	Tension Demand input. Expects Over (true) or Under (false).
Overspeed	Speed Demand input. Expects a value between -120% and 120%.
Preset Enable	Diameter Calc. input. Expects Enabled (true) or Disabled (false).
Rewind-Unwind	Tension Demand input. Expects Rewind (true) or Unwind (false).
Run Delta	Speed Demand input. Expects a value between 0 and 100%.
Stall Enable	Tension Demand input. Expects Enabled (true) or Disabled (false).
Stall Select	Tension Demand input. Expects Proportional (true) or Fixed (false).
Stall Tension	Tension Demand input. Expects a value between -100% and 100%.
Start	Speed Demand input. Expects Enabled (true) or Disabled (false).
Stop Delta	Speed Demand input. Expects a value between 0 and 100%.
Taper SP	Tension Demand input. Expects a value between -100% and 100%.
Taper Select	Tension Demand input. Expects Hyperbolic (true) or Linear (false).
Tension Cal	Current Demand input. Expects a value between -100% and 100%.
Tension Delta	Tension Demand input. Expects a value between 0 and 1.0.
Tension Enable	Tension Demand input. Expects Enabled (true) or Disabled (false).
Tension SP	Tension Demand input. Expects a value between -100% and 100%.
Tension Scale	Current Demand input. Expects a value between -100% and 100%.
Tension Trim	Current Demand input. Expects a value between -200% and 200%.
UTS Threshold	Up to Speed input. Expects a value between -120% and 120%.
Variable Inertia	Current Demand input. Expects a value between -100% and 100%.
WB Threshold	Diameter Calc. input. Expects a value between 0 and 100%.
WB Reset	Diameter Calc. input. Expects Enabled (true) or Disabled (false).
Width	Current Demand input. Expects a value between -100% and 100%.
Winder Speed	General input. Expects a value between -120% and 120%.