**SP1070PID Basic PID Controller**

**Loadcell Tension Control**

In this application the SP1070PID provides constant tension control by means of loadcell feedback trim of the reference speed.

This method of tension control can be used either with a medium performance center winder (as illustrated), or between nip rolls, or with a surface winder.

**Dancer Position Control**

Here the SP1070PID is used to control dancer position by sensing arm movement and trimming drive speed.

Tension is adjusted by changing the load on the dancer arm (usually by means of a low friction air cylinder or balance weights).

This method of control can be used either with a medium performance center winder (as illustrated), or between nip rolls, or with a surface winder.

**Position Control with Acoustic Sensor**

This application is a non-contacting method of controlling the height of the web for use where the surface could be marked by a conventional dancer or idler roll.

**Other applications for the SP1070PID include position, height, and fluid level control.**
Model SP1070PID
- Basic PID Controller -

SET-UP PROCEDURE

1. Reference Documentation

1.1 SP1070PID Block Diagram 500298, wiring and assembly drawing 500299.
1.2 SP1070PID configuration drawing HC101767, & basic specification sheet UG101496.
1.3 Drive Manuals

2. Installation

2.1 This equipment incorporates high voltage supplies, and powerful machinery which are potentially very dangerous, and it is very important that the installation and set up must be carried out by qualified personnel.

2.2 The installation and set up for this winder system are written for use with Bardac drives and are not necessarily appropriate when used with other manufacturers' drives.

2.3 This equipment must be installed in a suitable electrical enclosure with the required protection, control, and operator components. It is the users responsibility to complete the system design, and to ensure that all applicable codes are met.

3. Setting Up The System

Please read the entire setting up instructions before starting the procedure to familiarize yourself with the general requirements.

3.1 Before attempting to proceed with the winder configuration and start up, disconnect the drive from this equipment and fully complete its start up in a basic speed control mode according to the instructions in the drive manual. Normally the drive should be configured to prevent accidental reverse operation if it is a 4-quadrant, regenerative controller.

3.2 Select correct AC supply voltage tap the card modules.
3.3 Initial settings for the equipment:

**SP1070PID Card Settings:**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp</td>
<td>MIN&lt;&lt;&lt;&lt;</td>
</tr>
<tr>
<td>Input Offset</td>
<td>&gt;&gt;MID&lt;&lt;</td>
</tr>
<tr>
<td>Differential Gain</td>
<td>MIN&lt;&lt;&lt;&lt;</td>
</tr>
<tr>
<td>Integral Zero</td>
<td>&gt;&gt;MID&lt;&lt;</td>
</tr>
<tr>
<td>Proportional Gain</td>
<td>MIN&lt;&lt;&lt;&lt;</td>
</tr>
</tbody>
</table>

**External Components**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Position/Tension Reference Pot</td>
<td>MIN&lt;&lt;&lt;&lt;</td>
</tr>
</tbody>
</table>

3.5 Set the Operator Reference Pot to MIN<<<<, and check that the input at terminal 17 is 0v.

With 0v on SP1070PID card terminal 17, and with no load on the Load Cell or with the Dancer in the fully extended position, adjust the Input Offset Pot to give 0v at terminal 16.

3.6 With the Prop Gain pot set to zero on the SP1070PID card, close the Integral Reset and check that the voltage on terminal 9 is 0v. Open and close the Integral Reset contact and observe the drift of the output at terminal 9. Adjust the Integral Zero pot to give minimum drift when the Integral Reset contact is opened. Remember that if there is a diode clamp on the Integral Output that will prevent the output from going negative, the drift should be set to be slow positive.

3.7a **Tension Control**

Check the polarity of signals to ensure that increase in Load Cell output gives decreasing motor current (torque) demand signal.

OR...

3.7b **Position Control**

Check the polarity of signals to ensure that rising loop or dancer output gives decreasing motor speed demand signal.

3.9 Check the set up of the rest of the system, splice sequences, standstill, hold, preset logic, jog, winder direction of rotation, etc.
4 Powering Up The System

4.1 Use extreme caution when powering up and be prepared to stop the drive at all times during this phase.

4.2 Thread material through the machine with all power turned off.

4.3 Take up material slack,

4.4 Turn power on

4.5a Tension Control
   Set low tension, start winder and check the standstill tension
   
   OR...

4.5b Position Control
   Set low position reference, start winder and check that the winder applies tension and controls the dancer height as required.
   Adjust the position reference to set the dancer about mid position.

4.6 Set slow line speed and start line. Adjust PROP GAIN and DIFF GAIN terms to give stable winder performance with repeated Line Start/Stop operation.

4.7 Gradually increase line speed and optimize the performance over the complete range of Line Speeds, Tensions, Taper, Roll Build-up, and materials.

5 Documentation

5.1 Make a complete record of your system set up and file securely with your manuals and drawings for future reference.

BASIC WINDER TYPES WINDER or UNWINDER
   SINGLE WEB or MULTIPLE SLIT WEB
   SINGLE CORE or TWIN TURRET
   INDEXING: MANUAL - AUTO
   SPLICING: MANUAL - AUTO
## 5.2 BASIC CONFIGURATIONS

### Center Winder

<table>
<thead>
<tr>
<th>Basic Torque Control</th>
<th>Basic Dancer Control</th>
<th>Basic Loadcell Tension Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque ∝ Armature current</td>
<td>Dancer position by PID or proportional feedback. Tension ∝ Dancer force</td>
<td>Tension by PID trim speed</td>
</tr>
<tr>
<td>Tension ∝ Torque ÷ Dia</td>
<td>Optional Taper Tension</td>
<td>Optional Taper Tension</td>
</tr>
</tbody>
</table>

### Requirements:
- Standard Drive
- Drive + SP1070PID
- Optional: E/P converter

### Optional Taper Tension

<table>
<thead>
<tr>
<th>Center Winder</th>
<th>Surface Winder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Tension Control</td>
<td>Torque control of support rolls</td>
</tr>
<tr>
<td>Torque ∝ Armature current</td>
<td>Tension ∝ Armature current</td>
</tr>
</tbody>
</table>

### Requirements:
- Standard Drive
- Drive + SP1070PID
- Optional: E/P converter

## 5.3 PERFORMANCE CONFIGURATIONS

### Constant Tension Center Winder (CTCW)

<table>
<thead>
<tr>
<th>Diameter calculated</th>
<th>Torque Armature current</th>
<th>Tension Torque ÷ Dia</th>
</tr>
</thead>
</table>

### Center Winder

<table>
<thead>
<tr>
<th>Dia Comp. Dancer Control</th>
<th>Dia Comp. Loadcell Tension Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dancer position by PID or proportional feedback.</td>
<td>Dia by acoustic sensor</td>
</tr>
<tr>
<td>Dia by acoustic sensor</td>
<td>Tension by PID trim speed</td>
</tr>
<tr>
<td>Tension ∝ Dancer force</td>
<td>Optional Taper Tension</td>
</tr>
</tbody>
</table>

### Requirements:
- Drive + SP1070PID + Sensor
- Optional: E/P converter

### Surface Winder

<table>
<thead>
<tr>
<th>Dia Comp. Tension Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia by acoustic sensor</td>
</tr>
<tr>
<td>Torque control of support rolls</td>
</tr>
<tr>
<td>Tension ∝ Armature current</td>
</tr>
</tbody>
</table>

### Requirements:
- Drive + 430(1/Dia) + Acoustic Sensor

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1/21/98 **Bardac Corporation** 40 Log Canoe Circle, Stevensville, MD 21666
Phone: (410) 604-3400 Fax: (410) 604-3500 info@bardac.com
## 5.4 CONTROL FUNCTIONS AVAILABLE

<table>
<thead>
<tr>
<th>Constant Tension Center Winder (CTCW)</th>
<th>Center Winder Dia Comp. Dancer Control</th>
<th>Center Winder Dia Comp. Loadcell Tension Control</th>
<th>Surface Winder Dia Comp. Tension Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Friction</td>
<td>Web Break Sensing</td>
<td>Web Break Sensing</td>
<td>Static Friction</td>
</tr>
<tr>
<td>Dynamic Friction</td>
<td>Core Speed Matching</td>
<td>Core Speed Matching</td>
<td>Dynamic Friction</td>
</tr>
<tr>
<td>Inertia Compensation</td>
<td>Max &amp; Min Dia limits</td>
<td>Max &amp; Min Dia limits</td>
<td>Inertia Compensation</td>
</tr>
<tr>
<td>Web Break Sensing</td>
<td>Digital diameter memory</td>
<td>Digital diameter memory</td>
<td>Web Break Sensing</td>
</tr>
<tr>
<td>Core Speed Matching</td>
<td>Electrical-to-Pressure converter.</td>
<td></td>
<td>Core Speed Matching</td>
</tr>
<tr>
<td>Max &amp; Min Dia limits</td>
<td></td>
<td></td>
<td>Max &amp; Min Dia limits</td>
</tr>
<tr>
<td>Digital diameter memory</td>
<td></td>
<td></td>
<td>Digital diameter memory</td>
</tr>
</tbody>
</table>

## 5.5 BASIC WINDER SYSTEM SPECIFICATIONS

### MECHANICAL DATA
- **LINE SPEED**
  - MAX \[\text{______ FPM}\]
  - MIN \[\text{______ FPM}\]

- **ROLL DIAMETER**
  - MAX \[\text{______ IN}\]
  - MIN \[\text{______ IN}\]
  - RATIO : : __:___

- **WEB TENSION**
  - MAX \[\text{______ LBF}\]
  - MIN \[\text{______ LBF}\]

  - CONTROL ACCURACY +/- _____ LBF

- **TAPER TENSION**
  - YES / NO
  - INCREASING - DECREASING _____%

- **MOTOR COUPLING**
  - TIMING BELT - GEARBOX - DIRECT

  - ESTIMATED FRICTION CHARACTERISTICS

  - REVERSING
  - YES - NO

### ELECTRICAL DATA
- **SUPPLY**
  - \[\text{____PHASE}, \text{______VOLTS, 50/60HZ}\]

- **BASIC MOTOR DATA**
  - ARMATURE \[\text{______VDC}\]
  - FIELD \[\text{______VDC}\]
  - SPEED \[\text{______RPM}\]

### ENVIRONMENTAL DATA
- **INDOORS**
  - or

- **OUTDOORS**

  - CLEAN - DUST - WATER - EXPLOSION PROOF

### DANCER SPECIFICATION
- **DANCER TRAVEL** \[\text{______INCHES}\]

- **DANCER INERTIA** \[\text{______MD}^2\]

  - TRANSUDER: \[\text{____K OHMS, HIGH O/P _____V, LOW O/P _____V}\]

### LOAD CELL SPECIFICATION
- **TRANSUDER:** \[\text{HIGH O/P _____V, LOW O/P _____V}\]
PID SYSTEM USING BUFFER CARD

THIS OPTION IS CON113

PRESET FUNCTIONS

CHANNEL 5 RAMP RATE
This sets the rate of the position reference change.
A long ramp time will give a gradual change to a new dancer position.

CHANNEL 4 SCALE
This sets the differential gain. Start at minimum gain, K1.

CHANNEL 4 OFFSET
This may be used as an on-board position reference set midway for centre position.

CHANNEL 3 SCALE
This sets TOTAL GAIN, K2.

CHANNEL 3 OFFSET
May be used to zero Integrator drift. Normally set midway (unless factory preset and sealed).

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DANGER CONSTITUTES A SAFETY HAZARD. IT
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SHOULD INSTALL THIS EQUIPMENT.

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ANY LIABILITY WHATSOEVER FOR THE
INSTALLATION IN A MANNER OTHER THAN
THAT SPECIFIED IN THE INSTALLATION
INSTRUCTIONS.
BASIC PID DANCER SYSTEM

BASIC PID LOOP HEIGHT CONTROL

BASIC PID LOAD CELL TENSION CONTROL
SP1070PID
DiN rail mounting unit
Dimensions: 4" high x 4" wide x 1 3/4" deep

SP1070PID SPECIFICATIONS:

Power Supply: 120VAC or 240VAC
Dancer Pot Supply: +/-10VDC 25mA max
Output: -10V to +10VDC (Output can be clamped for single direction operation.)

Scalable Functions:
Derivative Gain
Proportional / Integral Gain
Position Reference
Reference Ramp

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