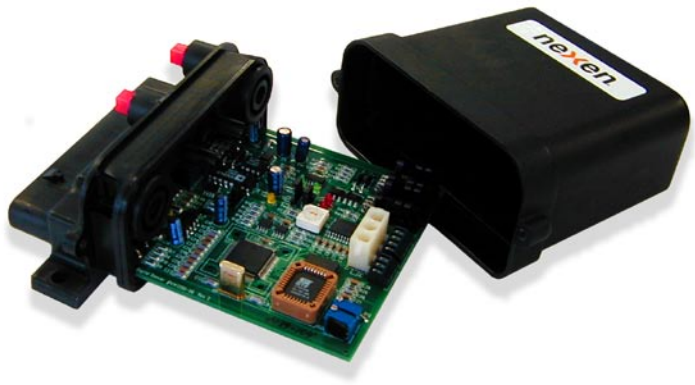
nexen®

WEB CONTROL PRODUCTS

User Manual



Adaptive Dancer Position Controller
RSD200 & RSD200P

FORM NO. L-21161-D-1105

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900

www.nexengroup.com

DANGER

Read this manual carefully before installation and operation.

Follow Nexen's instructions and integrate this unit into your system with care.

This unit should be installed, operated and maintained by qualified personnel ONLY.

Improper installation can damage your system or cause injury or death.

Comply with all applicable codes.

Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, Minnesota 55127

ISO 9001 Certified

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INTRODUCTION

The Nexen RSD200 is a microprocessor based position controller designed to minimize dancer arm movement during tension disturbances and then return the arm to its running position. The RSD200 features two different control choices:

- Use the analog output and a Nexen* current or voltage-to-pressure converter such as the EN40 or EN50 to control a Nexen* pneumatic brake or clutch (Refer to Figure 1).
- Use the analog output as a torque control signal for an unwind or rewind motor drive.

The RSD200 is housed in a dust tight and drip proof enclosure enabling it to be mounted near the brake or clutch.

All set up parameters are passed to the controller via RS232 connection that makes remote control and adjustment possible.

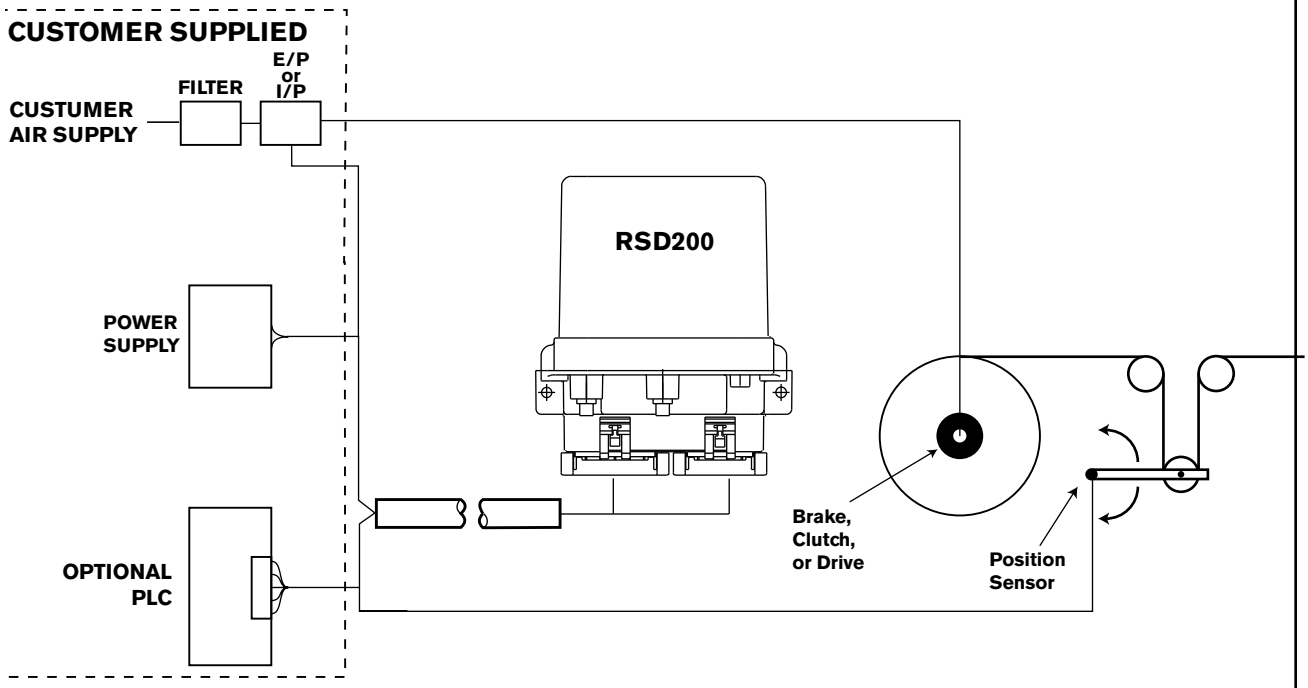

Figure 1

RSD200 Overview

As a roll changes diameter, a dancer control must adapt to the corresponding changes in speed, inertia and torque. Many web machines have very different tension settings. Therefore, compensating for the effects of tension setpoint changes is important if high dancer performance is desired. High dancer performance not only ensures constant tension, it allows for faster machine accelerations and decelerations, which means more production on many machines.

The RSD200 is a truly adaptive controller and will adapt its response to changing roll diameter and inertia conditions. This ensures that the RSD200 will always provide the right amount of action for stable dancer arm performance.

Other benefits: 1) Diameter sensing is not necessary 2) Splicing different size rolls without readjustment 3) Excellent performance at slow web speeds and on small rolls.

There are two models in the RSD200 product family: the RSD200 and RSD200P. The RSD200P provides all the same features and capabilities as the RSD200 plus tension compensation. In applications where tension setpoints change by more than ±50%, the RSD200P should be used.

*** Any appropriate transducer and clutch or brake unit may be used with the RSD200, but for optimal performance, Nexen recommends using the complete RSD dancer control system.**

1.0 INSTALLATION / CONNECTIONS

1.1 INSTALLATION

The RSD200 can be mounted horizontally or vertically near the pneumatic tension brake or clutch. Provide enough clearance around the RSD200 to allow removal of the cover and the hold down screws.

NOTE: For best performance and reliability, locate the current or voltage to pressure converter near the brake or clutch. Use a regulated filtered air supply (See SPECIFICATIONS section for filter details.)

CAUTION

Mount the RSD200 in a shock and vibration free area with an ambient temperature of less than 140°F [60°C] and more than 32°F [0°C].

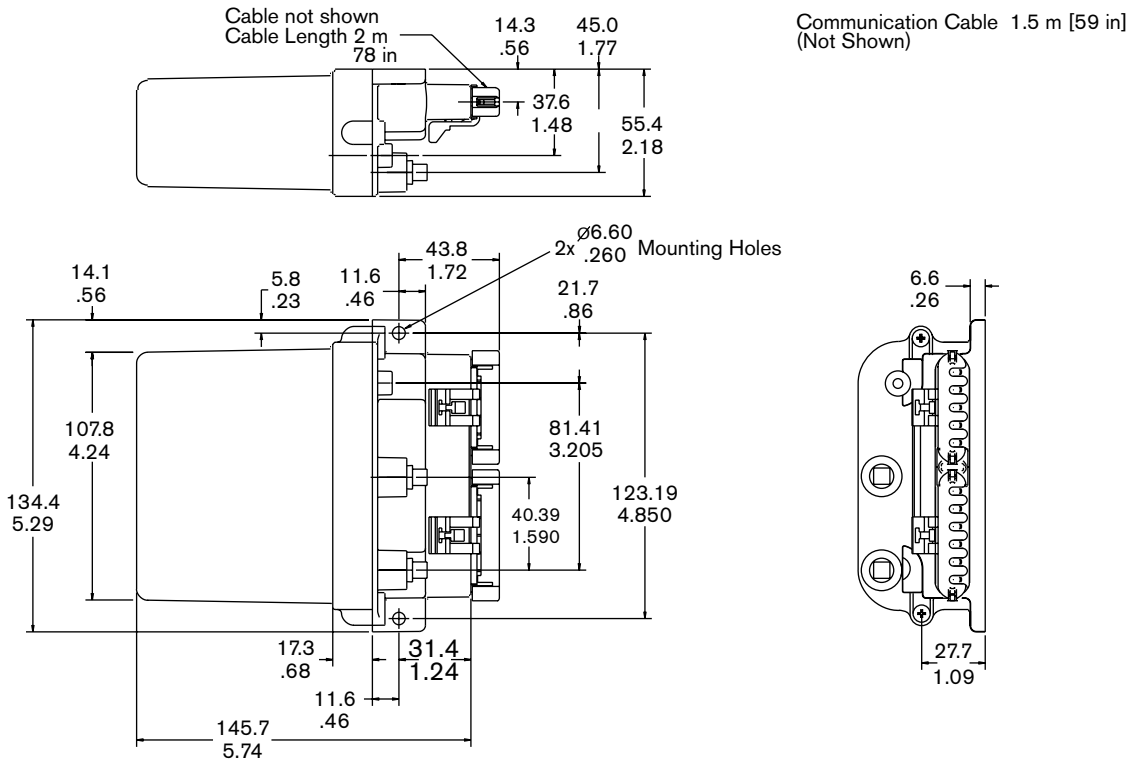

Figure 2

1.2 ELECTRICAL CONNECTIONS

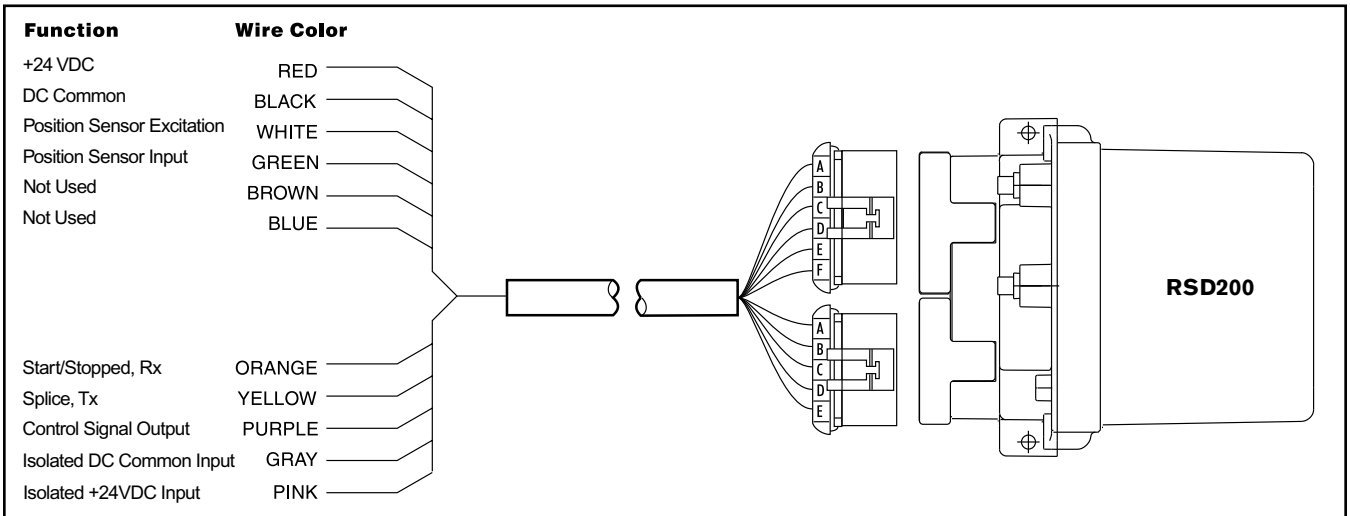

Figure 3 **RSD200 Electrical Connections**

+24 VDC & DC Common: RSD200 requires 24 VDC to operate (Refer to ***SPECIFICATIONS*** for current rating).

Position Sensor Excitation: This output provides +12 VDC as an excitation voltage for dancer arm position sensors such as Nexen's DPS 30 or DPS 60 and mechanical potentiometers (Refer to the ***SPECIFICATIONS*** section for current rating.).

Position Sensor Input: The position sensor input is a 0–10 or 0–12 VDC signal that is provided from the dancer arm position sensor. The choice of voltage range is selected by Jumper W3 (Refer to Figure 7). For best results the voltage range should match the dancer arm swing (i.e.: a 30° dancer arm swing should produce nearly a 0–10 VDC or 0–12 VDC position signal).

Start/Stopped Signal or RS232 Receive: This input has two functions: first, to accept a Start/Stopped Signal; and second, to act as the receive line for RS232 communications. The function is chosen by Jumper W5 (Refer to Figure 7).

As a Start/Stopped input, this signal uses Isolated DC Common as a return. When 12-24 VDC is applied, the controller will respond according to how this input was setup (refer to Start/Stopped Signal Selection Section). This feature tells the RSD200 controller when the machine starts and stops. A yellow indicator, I6, on the controller's printed circuit board will be on when 12-24 VDC is present at this input.

As the receive line (Rx) for RS232 communications, this input, the next input (Tx), and DC Common are all that is needed to communicate with the RSD200 (Refer to Figure 5). RSD200 setup, tuning and diagnostic parameters can be sent back and forth between the controller and other devices such as a PLC or computer by using RS232. When using this input as the receive line for RS232 communications, the Start/Stopped Signal command has to be sent via this communications link (See Communications Protocol in the Appendix).

Splice or RS232 Send: This input has two functions: first, to accept the Splice signal; and second, to act as the send line for RS232 communications. The function is chosen by jumper W6 (Refer to Figure 7).

As the Splice input, this signal uses the Isolated DC Common as a return. When 12-24 VDC is applied momentarily, the current ADAPTATION value will change to NEW ROLL ADAPTATION value (See TUNING and OPERATION sections) and the RSD200 will adapt to the new roll or core. A yellow indicator, I5, on the controller's circuit board will be on when 12-24 VDC is present at this input.

As the send line (Tx) for RS232 communications, this input, the previous input (Rx), and DC common are all that is needed to communicate with the RSD200 (Refer to Figure 5). RSD200 setup, tuning and diagnostic parameters can be sent back and forth between the controller and other devices such as a PLC or computer by using RS232. When using this input as the send line for RS232 communications, the Splice command has to be sent via this communications link (See Communications Protocol in the Appendix).

Control Signal Output: This output signal can be used as an input to a current or voltage-to-pressure converter or as a control signal to a motor drive. The output is chosen by jumper W7 (Refer to Figure 7). The output can be set to 0–10 VDC or 4–20 mA. Both ranges are already calibrated and ready for use.

Isolated DC Common Input: In cases where isolated Start/Stopped and Splice inputs or Control Signal Output is desired, this input is the return line for the isolated power supply (user supplied). If isolation is not needed, this input must be connected to DC Common input.

Isolated +24 VDC Input: In cases where isolated Start/Stopped and Splice inputs or Control Signal Output is desired, this input is the supply line for the isolated 15-24 VDC power supply (user supplied). If no isolation is needed, this input must be connected to the +24 VDC input (Refer to Figure 4).

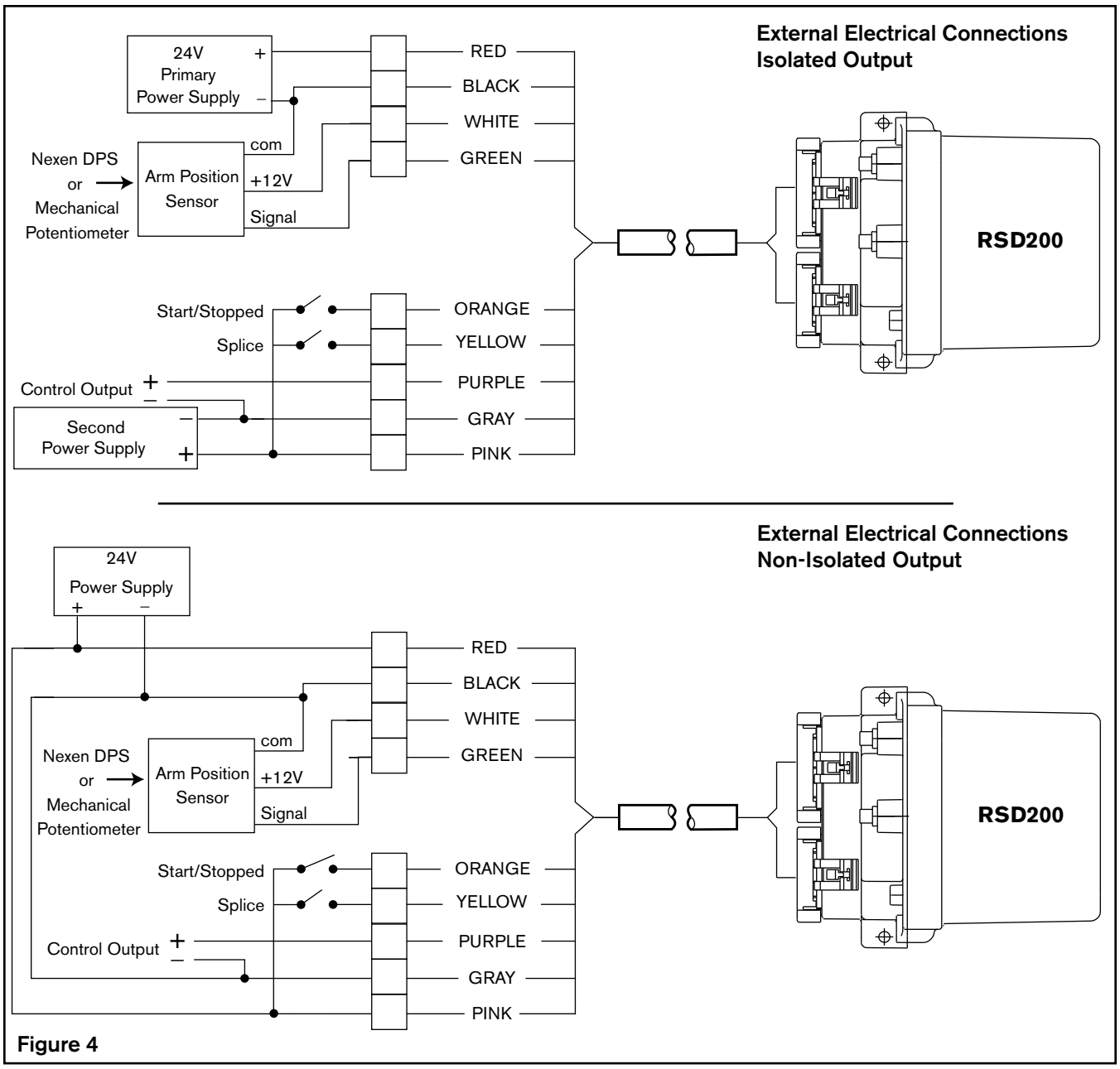

Figure 4

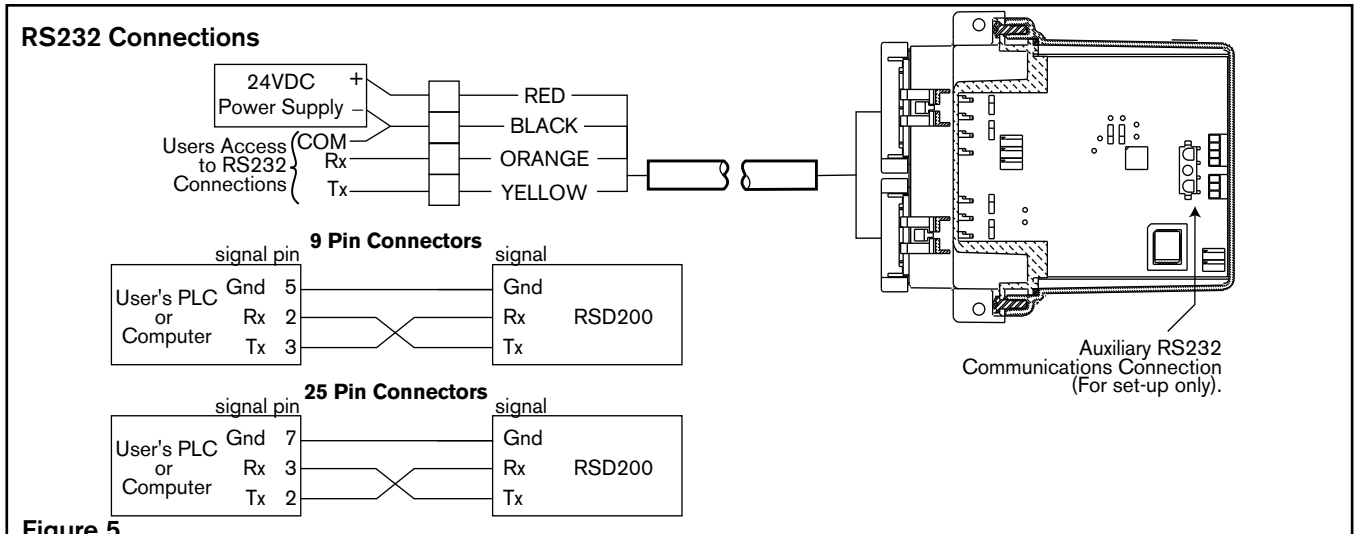

Figure 5

Minimum Connections Necessary For Pneumatic Brake or Clutch Application:

The RSD200 requires a +24 VDC Power Supply, Dancer Arm Position Sensor, Current- or Voltage-to-Pressure Converter, and a dry circuit contact or switch for any pneumatic brake or clutch applications. (Refer to Figure 4).
24 VDC Power Supply: Provides the power for operation (Refer to SPECIFICATIONS for details).
Dancer Arm Position Sensor: Provides an analog signal that tracks dancer arm movement.
Current- or Voltage-to-Pressure Converter: (ex. Nexen's EN50 or EN40) Converts the appropriate control output (i.e. 4-20 mA or 0-10 VDC) into air pressure for use with a pneumatic brake or clutch.
Start/Stopped Signal: Lets the RSD200 know when the web is moving or stopped.

Minimum Connections Necessary For Motor Drive Application:

The RSD200 requires a +24 VDC Power Supply, Dancer Arm Position Sensor, optional second power supply, and a dry circuit contact or switch for a motor drive applications. (Refer to Figure 4).
24 VDC Power Supply: Provides the power for operation (Refer SPECIFICATIONS for details).
Dancer Arm Position Sensor: Provides an analog signal that tracks dancer arm movement.
Optional Power Supply: Used when isolated inputs or outputs are required. Most commonly used to prevent the mixing of power supply commons together when connecting the analog output to a motor drive (Refer to SPECIFICATIONS for details).
Start/Stopped Signal: Lets the RSD200 know when the web is moving or stopped.

1.3 RSD200P PNEUMATIC CONNECTIONS

Nexen developed the RSD200P for applications that would benefit from tension setpoint compensation. The RSD200P features an integral pressure sensor that connects to the air supply pressure of the dancer arm loading cylinder. As the tension setpoint changes via the air pressure of the loading cylinder, the RSD200P measures this change and adjusts its performance accordingly. The RSD200P pressure sensor's calibration procedure is explained in the SENSOR CALIBRATION section.

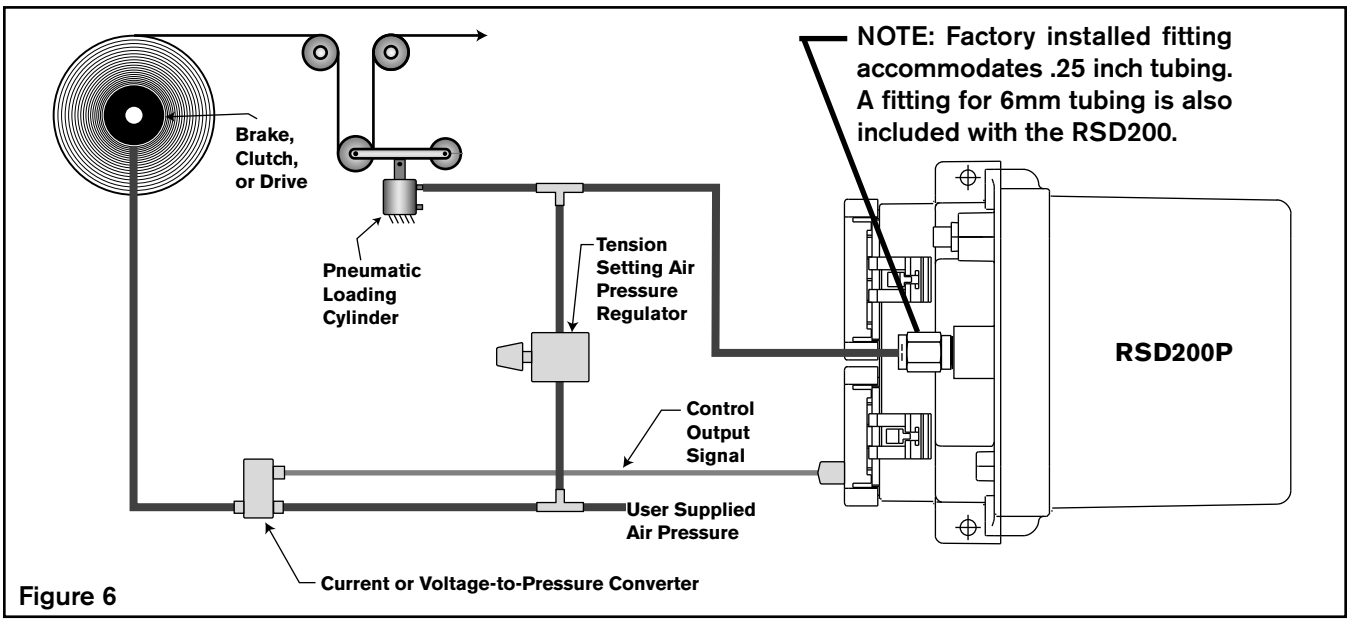

Figure 6

1.4 JUMPER & SWITCH SETTINGS

Make the appropriate Jumper and Switch Settings shown below for your application. The RSD200 printed circuit-board can be removed to allow access to all jumpers and switches.

Board Removal Instructions:

1. Remove power from RSD200.
2. Disconnect the Power and Signal Cable Connectors from the RSD200 base.
3. Move the printed circuit board side-to-side while pulling to remove board.

JUMPER AND SWITCH SETTINGS: (REFER TO FIGURE 7.)

Jumper W1	NORM, if controller action is backwards, then select REV
Jumper W2	Position 1, enables RSD Communications for remote setup
Jumper W3	10 V or 12 V, depends on maximum output voltage of sensor, use 10 V for Nexen's DPS 30 or DPS 60 sensor, and 12V for mechanical potentiometer
Jumper W4	10 V
Jumper W5	Dig. In 1, if using this input for Start/Stopped Signal Rx, if using this input for RS232 communication
Jumper W6	Dig. In 2, if using this input for Splice Signal Tx, if using this input for RS232 communication
Jumper W7	V Out, for 0 – 10 VDC analog output I Out, for 4 – 20 mA analog output
Rotary Switch	Refer to Table 2

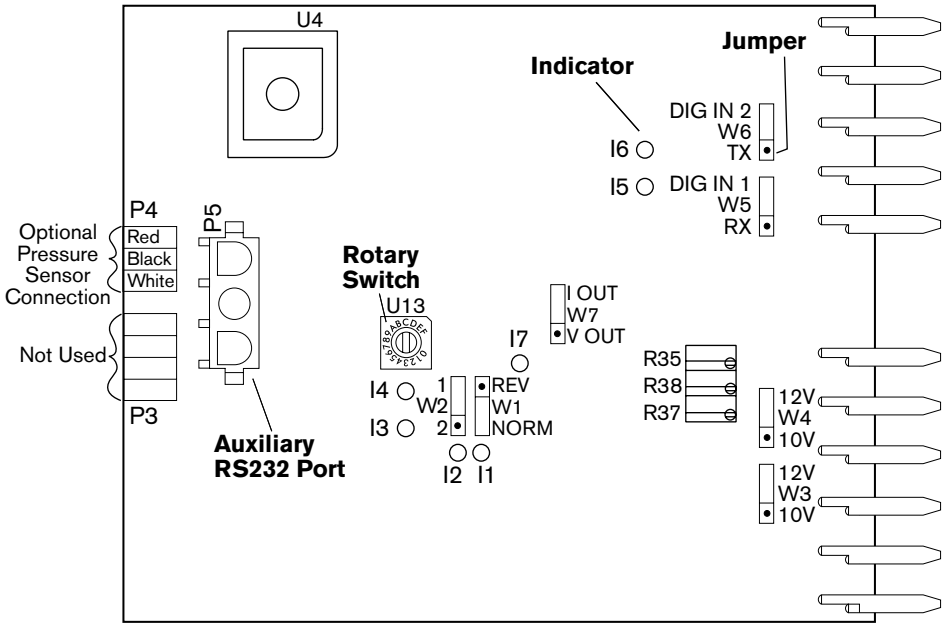

Figure 7

Table 1

Designation	Color	Function
I1	Green	"ON when +5 VDC is present
I2	Green	"ON" when +12 VDC is present
I3	Red	"ON" when increasing air pressure
I4	Red	"ON" when decreasing air pressure
I5	Yellow	"ON" when voltage is applied to Boost Input
I6	Yellow	"ON" when voltage is applied to Machine State Input
I7	Yellow	"ON" when in manual control

Start / Stopped Signal Selection

The RSD200 determines the start/stop state of a machine through the Start/Stopped Signal Input. The RSD200 was designed to accommodate many different types of machine state signals.

The following figure and descriptions detail the variations of Start/Stopped signals that the RSD200 accepts.

After choosing the appropriate signal, set the rotary switch on the RSD200 printed circuit board per Table 2.

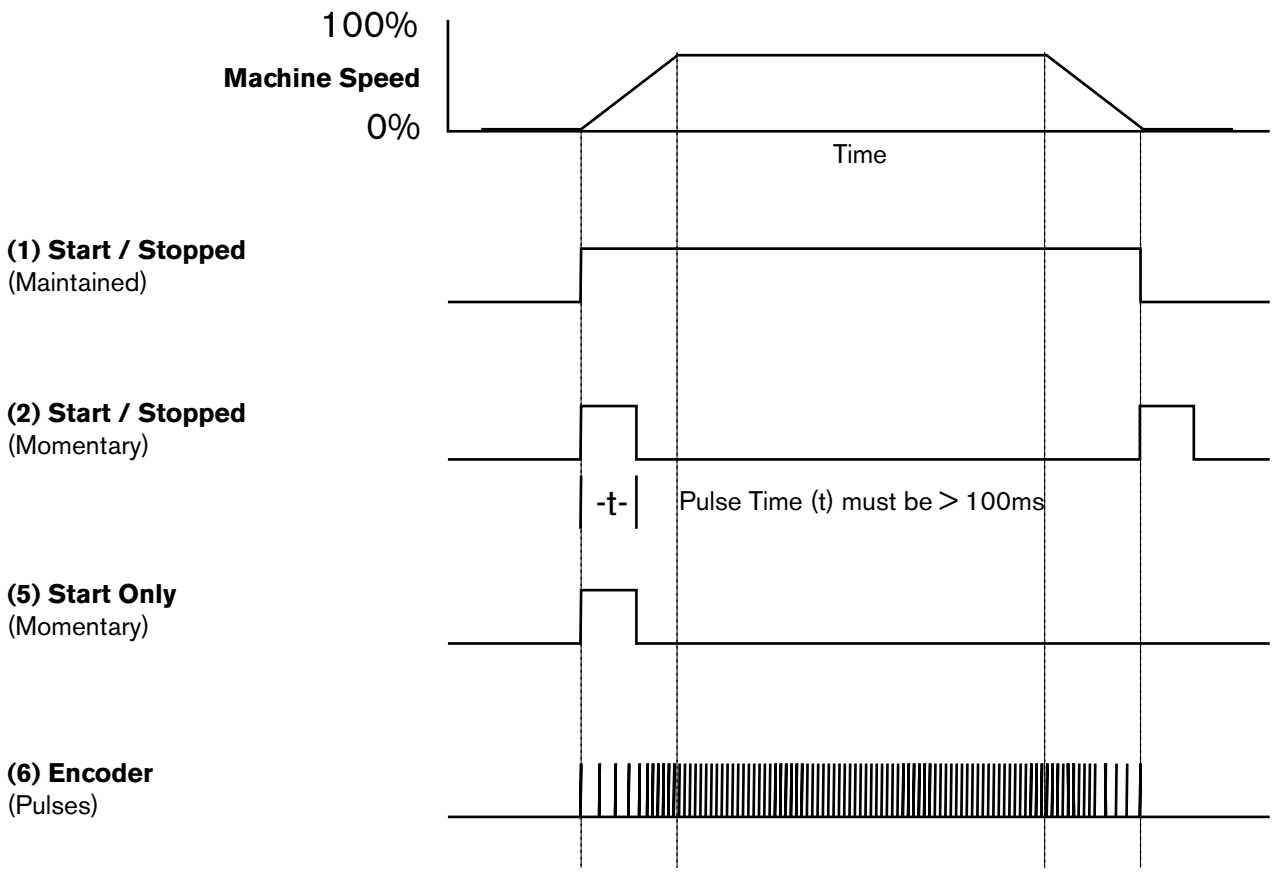

Figure 8

Start/Stopped Signal Descriptions

Start / Stopped Signal (Maintained)

When the Start/Stopped input signal is maintained low, the RSD200 assumes the machine is stopped. When the Start/Stopped input signal transitions to a maintained high, the RSD200 algorithm will begin adapting to account for the roll's diameter and inertia, and in the case of the RSD200P, web tension. The web must be in motion when this signal goes high otherwise the Adaptive Gain will increase to maximum. After the Start/Stopped signal transitions back to low, the Adaptive Gain will return to a constant value (See OPERATIONS section).

Start / Stopped Signal (Momentary)

When the Start/Stopped input signal pulses high, the RSD200 algorithm will begin adapting to account for the roll's diameter and inertia, and in the case of the RSD200P, the web tension. The web must be in motion when this signal goes high otherwise the Adaptive Gain will increase to maximum. After the Start/Stopped signal pulses high a second time, the Adaptive Gain will return to a constant value, because the RSD200 assumes the machine has stopped (See OPERATIONS section).

Start Only Signal (Momentary)

When the Start/Stopped input signal pulses high, the RSD200 algorithm will begin adapting to account for the roll's diameter and inertia, and in the case of the RSD200P, the web tension. The web must be in motion when this signal goes high otherwise the Adaptive Gain will increase to maximum. After the machine stops, the RSD200 will continue trying to adapt until the Start/Stopped input pulses high again and causes the adaptation process to start over.

Encoder (Pulses)

The first time a machine driven encoder pulses the Start/Stopped input high, the RSD200 algorithm will begin adapting to account for the roll's diameter and inertia and, in the case of the RSD200P, the web tension. The web must be in motion when this signal goes high otherwise the Adaptive Gain will increase to maximum. The RSD200 will continue to actively adapt until the encoder pulses cease for three seconds. At that time, the RSD200 will assume the machine has stopped and the Adaptive Gain will return to a constant value (See OPERATIONS section).

Table 2

Rotary Switch Position	Start/Stopped Signal
0	Not Used
1	Start / Stopped (Maintained)
2	Start / Stopped (Momentary)
3	Not Used
4	Not Used
5	Start Only (Momentary)
6	Encoder (Pulses)

Determine which signal type your machine uses and set the Rotary Selection Switch (See Figures 7 & 8).

1.5 RS232 SERIAL COMMUNICATIONS, RSD200 TO A PC

In order to setup the RSD200, a serial cable and the RSD200 Communications Software are required. A custom RS-232 serial cable is provided with the RSD200 Dancer Controller. The RSD200 Communications Software is available free by download from Nexen's web site, www.nexengroup.com, or by purchase from Nexen.

Downloading the Software from the Nexen Web Site

1. Enter the RSD200 Communications Software product number (see PART NUMBER section) in the product number search window and press Go.
2. Under Resources, select Software.
3. Next select the appropriate software product.

Instructions for installing the software as well as the Download Software link can be found under Resources. Instructions for using the RSD200 Communications Software can be accessed in the Help menu.

Getting Started with the Communications Software
After completing all jumper and switch settings:

1. Replace printed circuit board and reconnect connectors.
2. Connect the RSD Communications cable from the PC to the Auxiliary RS232 Port (see Figure 9).
3. Apply 24 VDC power.
4. Check that the green Indicators, I1 and I2 are on. If not, refer to the TROUBLESHOOTING section.

NOTE: The remaining steps involve configuring the RSD200 via the RSD200 Communications Software.

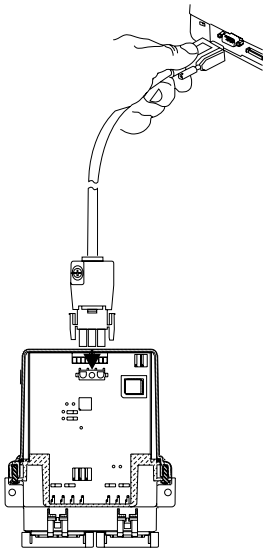

Figure 9

2.0 COMMUNICATIONS SOFTWARE SETUP

Select the setup icon in the toolbar.

2.1 TORQUE ACTUATOR

Select the type of actuator the RSD200 will control "pneumatic brake/clutch" or "drive or magnetic particle."

2.2 UNWIND OR WIND

Select whether the RSD200 will control a wind or unwind dancer arm.

2.3 OUTPUT LIMITS

The MINIMUM and MAXIMUM OUTPUT settings override all other settings and allow the RSD200 OUTPUT to be limited. Generally the MINIMUM and MAXIMUM will be set at 1 and 100% respectively. These values may need adjustment for some applications.

Example One: Air supply pressure exceeds the maximum air pressure rating of a brake or clutch. For instance, an I/P transducer can supply 125 psi to a brake rated for 80 psi. The MAXIMUM OUTPUT % should be set as follows:
MAXIMUM OUTPUT % = (maximum brake pressure / supply air pressure) * 100 = (80 / 125)*100 = 64%

Example Two: A pneumatic brake or clutch that is spring disengaged; In this case the MINIMUM OUTPUT % would be set high enough to overcome the spring and allow the friction facing to lightly contact the rotor.

The STOPPED OUTPUT setting is used to limit how high the output can go while the RSD200 is in STOPPED mode. This value supersedes the MAXIMUM OUTPUT value during stopped conditions. It is used in applications when the machine is stopped and a small amount of drag tension is desired on the web. If the STOPPED OUTPUT function is not needed then make it equal to the MAXIMUM OUTPUT value.

2.4 UNITS

Select English (psi & lb force) or Metric (kPa & Newtons).

Press the SEND button to send the SETUP values to the RSD200.

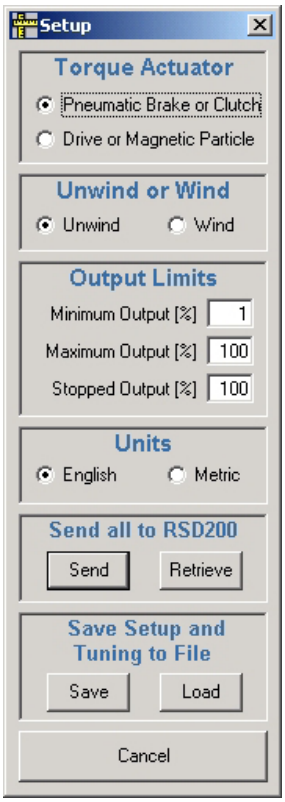

Figure 10

3.0 SENSOR CALIBRATION

Select the Sensor Calibration icon in the toolbar. 

3.1 DANCER RANGE

The Dancer Arm Position Sensor must be calibrated before the RSD200 can operate properly.

1. Select DANCER RANGE.
2. Follow the displayed instructions.

Calibration involves moving the dancer to each of its limits and pressing the appropriate DANCER RANGE buttons. The direction of dancer arm movement is automatically accounted for in this calibration process.

Figure 11

3.2 WEB TENSION - RSD200P ONLY

If the machine's tension setpoint varies more than +/- 50%, RSD200 performance can be improved with tension compensation. Improved performance will allow faster machine accelerations & decelerations.

If the machine's tension setpoint does not vary more than +/- 50%, or the Tension Compensation is not chosen, the WEB TENSION CALIBRATION window can be left with default values in the PRESSURE and TENSION fields.

Setting up tension compensation involves calibrating the RSD200 to convert Dancer Arm loading pressure into total tension. Consequently, total web tension must be physically measured (or calculated) for minimum and maximum tension during the setup process.

Select Web Tension from Sensor Calibration Window.

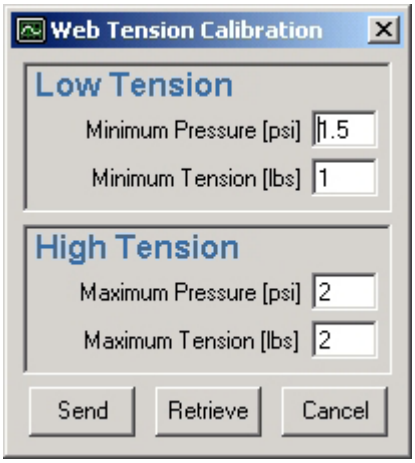

Figure 12

Low Tension

Machine with Tension Measurement System:

1. Setup the web machine with the minimum tension.
2. Run the machine at a slow run speed and adjust the output of the RSD200 manually until the dancer arm is stable.
3. Enter the measured web tension and Dancer Arm loading pressure values in the Low Tension fields of the Web Tension Configuration window.

Machine without Tension Measurement System:

1. Set the dancer pressure to the minimum.
2. With a scale, measure the force it takes to hold the dancer arm in its operating position.
3. Use the following formula to calculate total web tension: Total Tension = Force Measurement / ((Number of dancer rollers)•2).
4. Enter the web tension and Dancer Arm loading pressure values in the Low Tension fields of the Web Tension Configuration window.

High Tension

1. Repeat the steps in LOW TENSION section at maximum tension.
2. **Press the SEND button to send the WEB TENSION CALIBRATION values in the RSD200.**

4.0 TUNING

Select the Tuning icon from the toolbar. 

4.1 BASIC TUNING PARAMETERS

Most applications only require adjustment of GAIN and NEW ROLL ADAPTATION to tune the RSD200. For extreme applications, the RSD200 offers advanced tuning parameters (See section 4.2).

NOTE: To view diagnostics, select the Diagnostics icon from the toolbar; then select Start in the Communications Pane (See Diagnostics Section).

GAIN

Note: Gain must be adjusted first, because it affects all other tuning parameters and controls how the dancer arm responds to errors.

1. Operate the machine at a slow run speed with a nearly full roll.
2. When the machine is at a constant speed, allow about five seconds for the RSD200 to adapt (black line on the diagnostics trend levels off), then perform the following test:
   a) Change the dancer arm SETPOINT by 10%; press SEND. The dancer arm should move to the new SETPOINT in about two seconds with little or no overshoot.
   b) If the arm takes more than two seconds to reach the new SETPOINT, increase Gain slightly and repeat the test.
   c) If dancer arm becomes unstable after a SETPOINT change, decrease Gain and test again.

NEW ROLL ADAPTATION

NEW ROLL ADAPTATION is the beginning adaptation value that the RSD200 will adapt from after receiving a Splice signal. The closer this value is to the actual Adaptation value the shorter the time required for the RSD200 to adjust itself to actual roll conditions; so NEW ROLL ADAPTATION needs to be set for a new roll.

NOTE: If a machine is started with a new roll smaller than the roll used to set NEW ROLL ADAPTATION, the controller gain could be too high, causing the dancer arm to become unstable.

Unwind Applications: Unwind applications begin with new rolls and run them down to their core diameter. Some unwind applications start with the same diameter roll every time; others start with rolls of various diameters. NEW ROLL ADAPTATION should be set to the ADAPTATION value shown in the CONTROL pane of the DIAGNOSTICS Window when running the smallest diameter new roll under minimum tension conditions (See Figure 18).

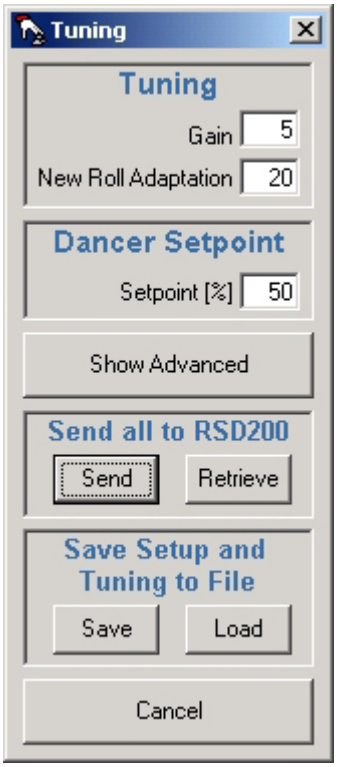

Figure 13

1. Load the smallest diameter roll you would begin with (or splice in) on the machine and set the web tension to minimum.
2. Operate the machine at a slow run speed.
3. Allow 10 seconds for RSD200 to adapt after machine has reached run speed.
4. Read the ADAPTATION value shown in the CONTROL pane of the DIAGNOSTICS Window and enter this number for the NEW ROLL ADAPTATION on the TUNING window.
5. Press SEND on the TUNING window.

Winding Applications: Winding applications begin at core or with small diameter rolls and create larger diameter rolls.

In winding applications NEW ROLL ADAPTATION is typically set the same as MINIMUM ADAPTATION.

If partial rolls are loaded on the winder shaft, NEW ROLL ADAPTATION can be increased to provide an ADAPTATION value closer to what a minimum sized partial roll would require.

4.2 DANCER SETPOINT

The RSD200 will maintain the dancer arm position at the dancer SETPOINT value when the machine is running. The RSD200 will still be active when the machine is stopped. For most applications, the Dancer SETPOINT is set to 50%. However, the Dancer SETPOINT can vary from 50% to provide more or less web storage depending on the machine's acceleration and deceleration requirements.

DANCER SETPOINT values range from 0% minimum storage position to 100% maximum storage position and can be found in the DANCER SETPOINT pane of the TUNING window.

4.3 ADVANCED TUNING PARAMETERS

For most applications the Basic Tuning Parameters will be sufficient to tune the RSD200.
The Advanced Tuning Parameters are for applications with unique requirements such as:

- extremely fast accelerations/decelerations
- zero web tension during stops
- frequent starts and stops

System Integrators appreciate these parameters as they provide the flexibility to customize the control system similar to that of hardware based control boards.

Select SHOW ADVANCED from the Tuning window.

NOTE: The following parameters have all been set to a factory default.

Dampening

DAMPENING effects how responsive the controller is. Once GAIN has been set, DAMPENING can be adjusted to make the control more sluggish (larger number) or more responsive (smaller number). The default setting will work for most applications, but if the dancer arm experiences high frequency movement due to out-of-round rolls or vibrations, increase DAMPENING.

Minimum Adaptation

MINIMUM ADAPTATION is the beginning point for ADAPTATION after an adaptation reset caused whenever the dancer arm is at the maximum storage position while the RSD200 is stopped. If dancer arm oscillations persist when starting near core, then reduce the MINIMUM ADAPTATION in increments of 0.5 and test again.

Maximum Adaptation

MAXIMUM ADAPTATION is the maximum limit of the Adaptation Term. This parameter is useful to limit how high the RSD200 ADAPTATION value can go. If the ADAPTATION value rises too high and causes dancer arm oscillations, lower the value to prevent oscillations.

Adaptation Rate

ADAPTATION RATE effects how fast the controller adapts to a roll's diameter and inertia. If you set the parameter too low, the control will be slow to adapt. This can cause the dancer arm to slowly oscillate about the SETPOINT during start-up. If set it too high, at core the RSD200 will adapt very rapidly, causing the gain to become too large and the dancer arm to oscillate quickly.

Figure 14

5.0 OPERATION

5.1 MANUAL CONTROL OF RSD200 OUTPUT

Manual control of the RSD200 OUTPUT can be achieved by pressing the SWITCH TO MANUAL CONTROL button on the diagnostics screen (See Figure 18 in DIAGNOSTICS section).

The Increase buttons increase the RSD200 OUTPUT to the brake, clutch, or drive; and the Decrease buttons decrease the RSD200 OUTPUT to the brake, clutch, or drive. Pressing the 10% buttons will increase/decrease the OUTPUT by 10% steps and pressing the 1% buttons will increase/decrease the OUTPUT by 1% steps.

Manual operation can be used for troubleshooting and stabilizing the dancer arm in order to take a measurement or reading. Press SWITCH TO AUTOMATIC CONTROL to return to automatic control.

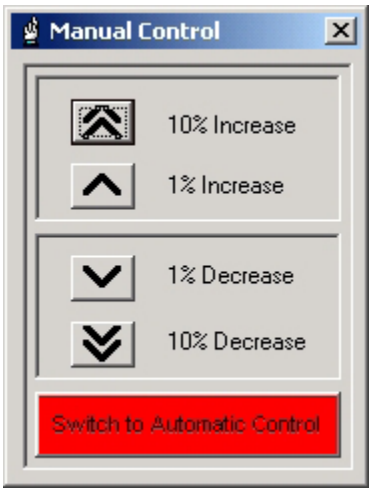

Figure 15

5.2 UNWIND APPLICATION

A typical unwind application begins with a new full roll. To insure that the dancer arm stabilizes as quickly as possible, the SPLICE signal should be used to reset ADAPTATION to NEW ROLL ADAPTATION before the machine starts. This shortens the time it takes for the RSD200 to adapt its gains to the new roll.

If a SPLICE signal is not used, the dancer arm may be sluggish on the first start with a full roll, because the adaptation process will begin at MINIMUM ADAPTATION and take longer to reach the optimum gain. Once the RSD200 adapts to the new roll, ADAPTATION will level off and subsequent starts will adapt faster and the arm will quickly move into position. During a run, the adaptation process continually adjusts the gains to account for changes in the roll.

When the START signal goes high at the Start/Stopped input, the RSD200 will begin adapting. **The web must begin to move at this instant.**

As the roll begins to accelerate, the Dancer Arm will seek its home position as determined by SETPOINT% (0% is minimum storage position, 100% is maximum storage position). The roll will continue to decrease in size along with the ADAPTATION and OUTPUT values. During constant speeds the dancer arm will remain stable, but the output values will not be steady.

During a machine stop, ADAPTATION and OUTPUT values will initially increase to overcome a roll's inertia. After a STOPPED signal is given, the ADAPTATION value will behave as follows:

- If the ADAPTATION value was greater than NEW ROLL ADAPTATION before the stop, then ADAPTATION goes to the NEW ROLL ADAPTATION value.
- If the ADAPTATION value was in between NEW ROLL ADAPTATION and MINIMUM ADAPTATION before the stop, then ADAPTATION will remain between these two values. This is useful for small rolls that are started and stopped very frequently. The ADAPTATION value will be very close to the actual value needed and the Dancer Arm will be stable.
- If the ADAPTATION value was less than MINIMUM ADAPTATION before the stop, then ADAPTATION goes to the MINIMUM ADAPTATION value.

When the RSD200 is in STOPPED mode, the ADAPTATION value will remain constant and the OUTPUT value will change depending on the Dancer Arm's position. The STOPPED OUTPUT value found in the OUTPUT LIMITS pane of the SETUP window is used to limit how high the output can rise. This is useful for applications where a minimal amount of tension on the web is desired during a stop.

After the START signal is given, the RSD200 adaptation will begin from the level as defined previously. This process is necessary to provide an adaptation value that is approximate for larger rolls and one that is much closer for smaller rolls.

Resetting Adaptation

Any time the SPLICE signal is given, the ADAPTATION value will be reset to NEW ROLL ADAPTATION. Also, if the ADAPTATION value rises too high (likely after a web break) it can be reset to MINIMUM ADAPTATION by moving the Dancer Arm to its maximum storage position while the RSD200 is stopped.

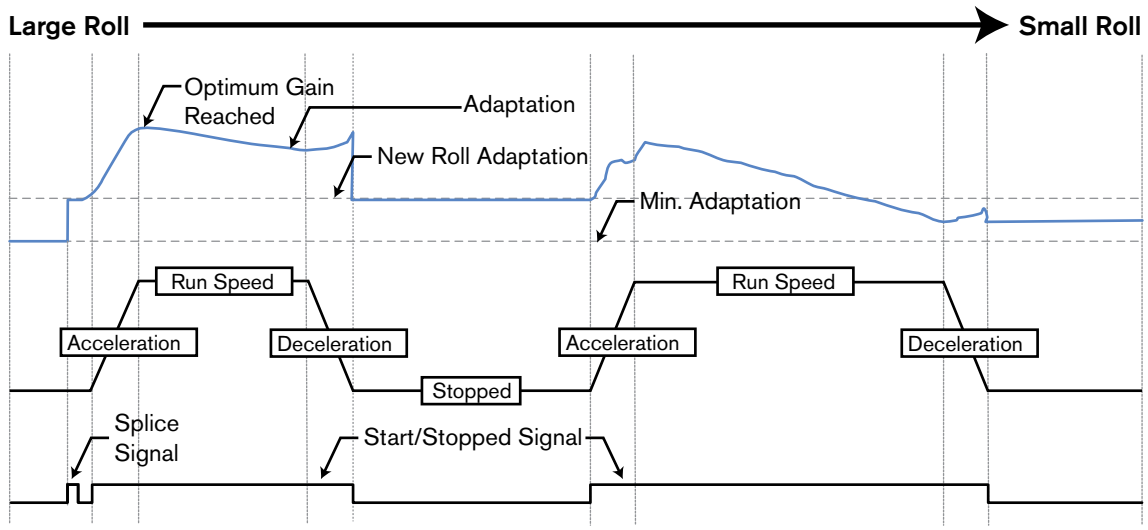

Figure 16

5.3 WIND APPLICATION

A typical winding application begins at core. To insure that the dancer arm stabilizes as quickly as possible, the RSD200 should start the adaptation process from MINIMUM ADAPTATION. This decreases the time it takes for the RSD200 to adapt its gains to the small roll, especially after completing the winding of a full roll. The ADAPTATION value is reset by moving the arm to its maximum storage position while the RSD200 is stopped or by providing a SPLICE signal.

The winder may remain active after the machine has come to a stop. The RSD200, even while Stopped, will also remain active and continually adjust its output to maintain the dancer arm's position.

When the START signal goes high at the Start/Stopped input, the RSD200 will begin adapting. **The web must begin to move at this instant.**

As the roll begins to accelerate, the Dancer Arm will seek its home position as determined by SETPOINT% (0% is min storage position, 100% is max storage position). The roll will continue to increase in size along with the ADAPTATION and OUTPUT values. During constant speeds the dancer arm will remain stable, but the output values will not be steady.

During a machine stop, the ADAPTATION and OUTPUT values will initially increase to overcome the roll's inertia. After the web has come to a complete stop and the STOPPED signal is given at the Start/Stopped input, the ADAPTATION value will behave as follows:

- If the ADAPTATION value was greater than NEW ROLL ADAPTATION before the stop, then ADAPTATION goes to the NEW ROLL ADAPTATION value.

- If the ADAPTATION value was in-between NEW ROLL ADAPTATION and MINIMUM ADAPTATION before the stop, ADAPTATION will remain between these two values.

When the RSD200 is in STOPPED mode, the ADAPTATION value will remain constant and the OUTPUT value will change depending on the Dancer Arm's position. The STOPPED OUTPUT value found in the OUTPUT LIMITS pane of the SETUP window is used to limit how high the output can rise. This is useful for applications where a minimal amount of tension on the web is desired during a stop.

After the START signal is given, the RSD200 adaptation will begin from the level as defined previously. This process is necessary to provide an adaptation value that is approximate for larger rolls and one that is much closer for smaller rolls.

Resetting Adaptation

Typically when a new core is loaded on the winder shaft, the web will become slack and the Dancer Arm will go to its maximum storage position. After that happens, the ADAPTATION value will be automatically reset to MINIMUM ADAPTATION.

Any time the SPLICE signal is given with the web moving or stopped, the ADAPTATION value will be reset to NEW ROLL ADAPTATION. In most rewind applications NEW ROLL ADAPTATION will be set nearly the same as MINIMUM ADAPTATION as most winds begin at core. However, this also means that if the machine is stopped in the middle of a wind, and the RSD200 goes into STOPPED mode, then the adaptation process will begin from a low value after the next START signal. Therefore, the dancer arm will take longer to move into position as the RSD200 gains take longer to adapt to their optimum level.

Spring Disengaged Clutch

It is common to use a spring-disengaged clutch on a winder and this spring can affect performance if the RSD200's output becomes too low. Use the MINIMUM OUTPUT setting found in the OUTPUT LIMITS pane of the SETUP window to keep the OUTPUT high enough to overcome the disengage spring force.

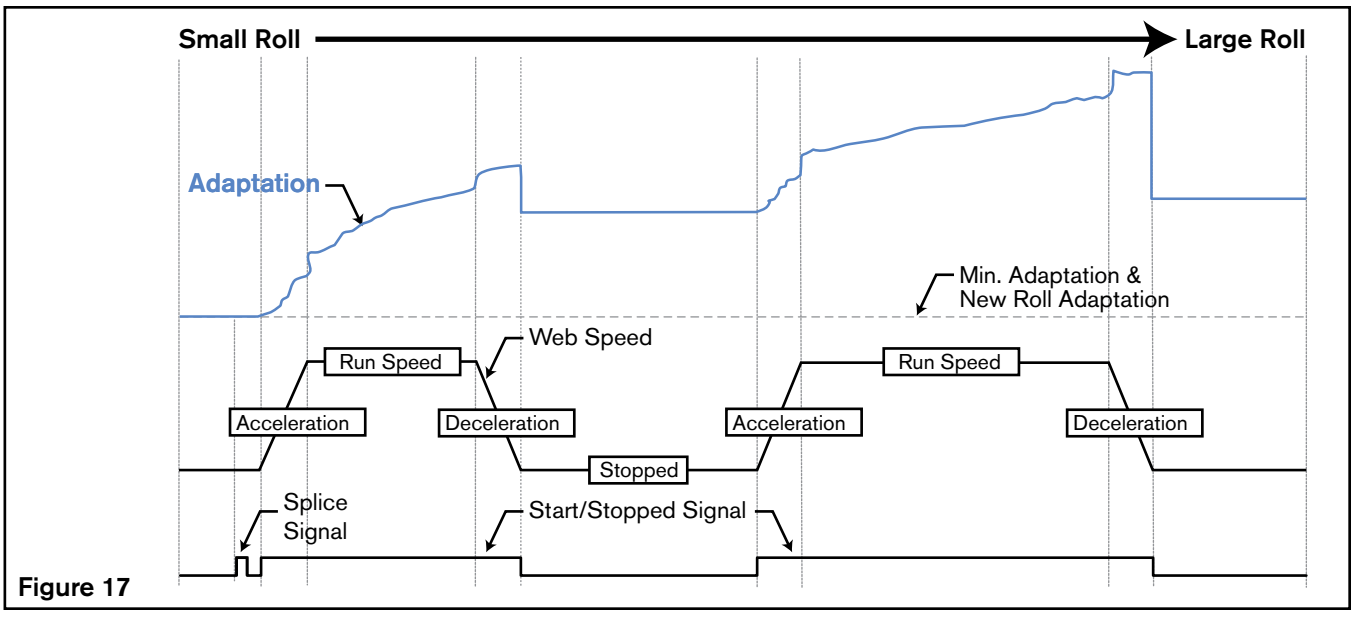

Figure 17

5.4 SPLICE

The RSD200 utilizes “Smart Splicing” which means that rolls of different sizes can be loaded or spliced into the machine without having to readjust the controller.

The RSD200 will adapt automatically to the new roll after receiving the SPLICE signal. When the SPLICE input pulses high, the controller will reset the adaptation level to the level defined by NEW ROLL ADAPTATION. The SPLICE input can be used anytime a new roll is loaded on the machine and the machine can be running or stopped. The SPLICE input must be held high for at least 100 ms for the RSD200 to detect this signal. The adaptation process will begin immediately if the machine is running or will begin after the RSD200 receives a Start signal.

NOTE: If the new roll is smaller than the one used to set up NEW ROLL ADAPTATION, the Adaptation level could start out too high after a splice and the Dancer Arm may become unstable. When the SPLICE input pulses high, the MINIMUM ADAPTATION level is overridden.

6.0 DIAGNOSTICS

Select DIAGNOSTICS icon in the toolbar. 

The DIAGNOSTICS window displays real-time operating information from the RSD200. This can be used throughout the setup procedure to verify results from sensors and setup parameter settings. All functions of the DIAGNOSTICS window are explained in the HELP files of the RSD200 Communications software.

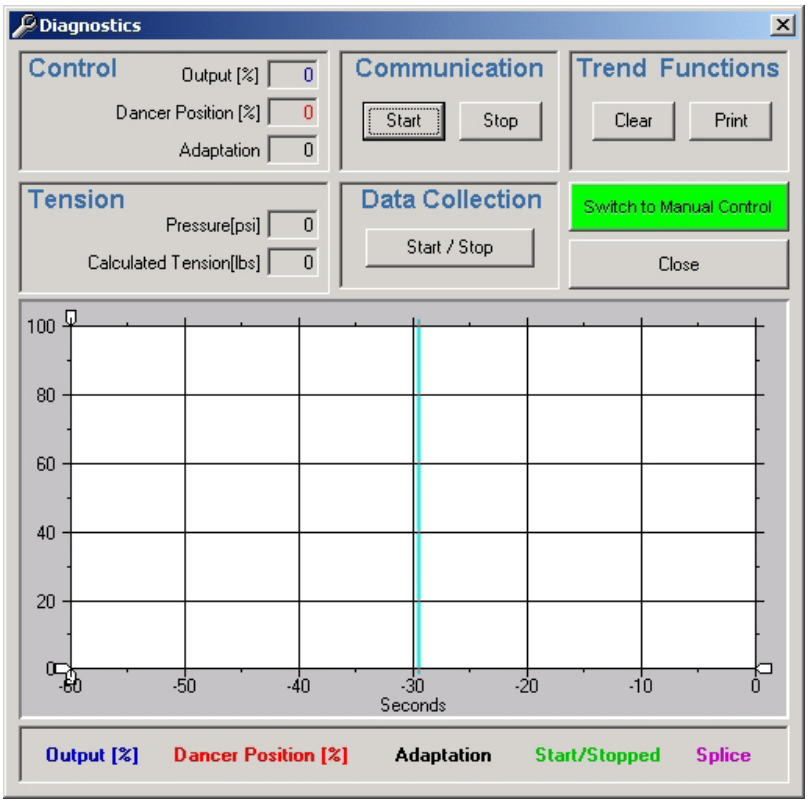

Figure 18

PART NUMBERS

Dancer Controller	(RSD200)	964531
Dancer Controller	(RSD200P)	964535
Dancer Position Sensors	(DPS30) (DPS60)	964510 964511
Communication Software (Download)		964527
Power Supply		964509

SPECIFICATIONS

Power Supply		+24 VDC @ 500 mA
Isolated Power Supply		15-24 VDC @ 150 mA
Operating Ambient Temperature		0° C [32° F] to 60° C [140° F]
Inputs	Digital	12-24 VDC @ 24 mA Maximum
	Dancer Arm Position	0-12 VDC Maximum @ 1 mA
	Dancer Arm Pressure	1.5 - 100 PSI [10.3 - 689 kPa]
Outputs	Control (Analog)	0-10 VDC or 4-20 mA
	Position Sensor Excitation Voltage	+ 12 VDC @ 100 mA
Enclosure		Nylon with O-ring Seal
Cables	Power	20 AWG Conductors, 2 m [78 in] long
	Communications	Serial, RS232 1.5 m [59 in] long
Air Supply	Pre-Filter	5 Micron
	Final Filter	.1 Micron
Certification		ETL & CE

SERVICE INSTRUCTIONS

Nexen does not recommend customer servicing of this product. Contact Nexen for replacement parts or repair.

TROUBLESHOOTING

Problem	Possible Cause	Quick Test	Corrective Action
Green LEDs are not lit.	No power to RSD200 board	Place the positive lead of Volt Meter on RED wire and Negative Lead on BLACK wire. Should meausre +24VDC.	If proper voltage is not measured: check wire connections and/or replace power supply.
Connection failed error when CONNECT icon is pressed, or PC is not communicating with RSD200.	RSD not powered up	Green LEDs, I1 and I2, on board should be lit.	Apply proper power to RSD200.
	Cable not connected	Ensure cable is connected from PCs RS232 port to P5 on the RSD200 board.	Connect cable properly.
	Faulty RS232 cable	Test continuity of cable (See Figure 5).	Replace cable if faulty.
	Jumper W2 in wrong position	Inspect position of W2.	Move W2 to position 1.
Bad Port number error is reported when CONNECT icon is pressed.	Wrong serial port is selected.	None	Select Communications Setup and switch to another port.
Digital Inputs not responding.	Improper jumper selection.	Check Jumpers W5 and W6 (Refer to Jumper & Switch Settings).	Set jumpers properly and test again.
	Input signals to RSD200 not being toggled.	Toggle the inputs and check for proper voltage changes (Refer to SPECIFICATIONS Section)	Set signal up properly and test again. Yellow LEDs, I5 &/or I6, should light when input is high.
RSD200 output does not move when the machine is started.	Start/Stopped Signal is not setup correctly.	The green trend line on the Diagnostics screen should show the Start/Stopped signal high when the machine is running.	Check the setup and make sure rotary switch selection is correct for the type of Start/Stopped signal used.
	RSD200 is in MANUAL mode.	Check SWITCH TO MANUAL button on the Diagnostics window.	Press the SWITCH TO MANUAL BUTTON and then SWITCH TO AUTOMATIC when the manual operations window appears.
RSD200 output changes, but the dancer arm does not move.	No air pressure to brake.	Use RSD200 setup screen to set Stopped Output to 100% and test if roll can be rolled by hand.	Troubleshoot pneumatic air circuit and check the pressure to the brake or clutch.
	Output limits are not set correctly.	Use RSD200 Setup screen to check the Maximum and Minimum Output Limits.	Set Maximum and Minimum Output Limits according to output range required (Refer to SETUP section).
	Tension is set too high on machine.	Reduce the dancer pressure/weight and test again.	If you have a multi-piston brake, make sure there are enough brake pistons engaged.
	No air pressure in roll core.	Core shaft should turn when the machine runs.	Apply proper air pressure to core and test again.
	Dancer Setpoint set improperly.	Use RSD200 Tuning window to check the DANCER SETPOINT %	Start with a DANCER SETPOINT of 50% (See the INSTALLATION section.)
Brake Clutch, or Drive does the opposite of what it should.	Controller action is backwards.	The brake output goes to minimum when the dancer arm storage is at the maximum or vise versa.	Change Jumper W1 setting (Refer to Jumper and Switch settings).
When machine speed is constant, dancer arm cycles continuously above and below setpoint or between max and minimum limit.	Gain is set too high.	Reduce Gain and see if arm stops cycling.	Refer to the TUNING section.
	Tension compensation not setup correctly (RSD200P only)	Measure tension on machine and see if it is close to the tension displayed on the RSD200 Diagnostics screen.	Refer to SENSOR CALIBRATION section.
RSD200 output goes to 0% output during acceleration (brake applications only).	Machine acceleration is too fast.	None	For a dancer control to work properly, the machine acceleration should be set so that some braking is used during acceleration. When the output to the brake is 0%, the RSD200 has no control over the dancer position.

APPENDIX

Communications Protocol

RS232 Communications can be used to broadcast Diagnostic Parameters from the RSD200 to a device such as a PLC or computer. At the same time, the PLC or computer would control the Start/Stopped and Splice signals to the RSD200.

Serial Communication is achieved with RS232 through a null modem cable. Data Transmission for each byte follows the format "19200, N, 8, 1" (19200 Baud, No Parity, 8 data bits, 1 stop bit) with no handshaking. Data is transmitted in 8 bit binary format, meaning that a number 0 to 255 is considered 1 byte and a number 0 to 65535 or -32676 to +32676 is considered two bytes. If a data item is two bytes long, the MSB is sent/received first and the LSB second.

Data is sent and received in Message Packets that are comprised of bytes of information (Refer to Table 3). The Checksum can be used as an error-checking tool to confirm the data sent on one end is the same as the data received on the other end. Use the Start byte to designate the beginning of a new message packet as well as the Stop byte to designate that the entire packet was sent/received. The Packet Size is the number of bytes in the packet, excluding the start and stop bytes.

- For commands sent from a PLC/Computer to the RSD200, refer to Table 4.
- For commands and/or data sent from the RSD200 to a PLC/Computer, refer to Table 5.

The Functional Test command can be used to confirm the communications are working properly.

1. From a PLC/Computer, send a Functional Test message packet (See Table 4).
2. If functioning properly, the RSD200 will immediately send a Functional Test packet back to the PLC/Computer (See Table 5).

The Machine Start/Stopped command operates as a maintained input therefore the Rotary Mode Switch needs to be in the "1" position (Refer to Start/Stopped section.)

Table 3 Message Packet Protocol

Byte Number	Description
1	**Start Byte**, value equal to 1
2	**Packet Size**, excluding Start & Stop
3	**Command ID**, identifies the function
4 -?	**Data,** variable length (if any)
? + 1	**Checksum**, the two-digit remainder of the division of the summation of the Data bytes and Command ID with 100 [i.e. (Data + Command ID) MOD 100].
? + 2	**Stop Byte**, value equal to 0

Table 4 Message Packets for PLC/Computer to RSD

Command ID	Function	Example
6	Start Diagnostics	1, 3, 6, 6, 0
7	Stop Diagnostics	1, 3, 7, 7, 0
14	Splice - True (Data=1)	1, 4, 14, 1, 15, 0
14	Splice - False (Data=2)	1, 4, 14, 2, 16, 0
15	Machine Start (Date = 1)	1, 4, 15, 1, 16, 0
15	Machine Stopped (Data = 2)	1, 4, 15, 2, 17, 0
16	Functional Test	1, 3, 16, 16, 0

Table 5 Message Packets for RSD to PLC/Computer

Command ID	Function		Example
6	**Receive Diagnostics Data**		1, 13, 6, Data, Checksum, 0
	Data	**Range**	
	Arm Position	0-255	
	Splice	0/1	
	Start/Stopped	0/1	
	Output	0-255	
	Pressure	0-10,000	
	Tension	0-10,000	
	Adaptation	0-10,000	
16	Functional Test		1, 3, 16, 16, 0

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Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, MN 55127

800.843.7445
Fax: 651.286.1099
www.nexengroup.com

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