

Bulletin 1365 Startup and Adjustment

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust and/or service this equipment. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: This equipment is at line voltage when AC power is connected. Disconnect and lockout all ungrounded conductors of the AC power line. Failure to observe these precautions could result in severe bodily injury or loss of life.

Review all startup and adjustment instructions thoroughly before making any adjustments or applying power to the controller. For your convenience throughout the setup and adjustment procedures, use Figure 1.1 or Figure 1.2 to locate adjustment pots, terminal boards, special selector jumpers and pins. Wiring diagrams are given in Figures 1.1, 1.2, 1.3 and 1.4 of document #1364.

Position the Controller Jumpers to Fit Application

The controller can operate on either 115V or 230V at multiple horsepower ratings and in various modes. Make sure the circuit jumpers are properly set for the application as described on the following pages. See Figure 1.1, which locates these special selector jumpers and pins.

J4: AC Input Voltage Jumper

Note: This jumper is on all controller models and is factory set for 230V AC.

1. Verify that J4 is positioned to match AC input line power.
2. If operation is on 115V, relocate J4 to the 115-volt jumper position.

J3: Voltage/Tach Feedback Selection Jumper

Note: This jumper is on all controller models and is factory set for a voltage feedback of 180V.

1. If operation is to be on 115V with voltage feedback, relocate J3 to the 90V jumper position.
2. If a tachometer feedback is to be used, relocate J3 to 'TACH' position irrespective of input voltage.

J200: Tachometer Scaling Jumper

Note: This jumper is on all controller models and is factory set for 7V DC/1000 tachometer scaling (pins 1 and 2).

1. If 20.8V DC/1000 tachometer scaling is desired, relocate jumper to the 21V position (pins 3 and 4).
2. If the controller is to be used as a voltage regulator, or torque regulator, leave this jumper set for the factory setting of 7V DC/1000 (pins 1 and 2).

J5: Controller Output Current Jumper

Note: This jumper is on all controller models and is factory set for 2.5 amperes.

1. Select the appropriate controller output current rating from the Table 1.A.
2. Position J5 for the current rating selected in Step 1.

Table 1.A. Controller DC Output Current Ratings. (1)

Motor HP	Controller Output Current Rating by Input Voltage Rating	
	115V AC	230V AC
1/4	2.5	---
1/3	5.0	---
1/2	5.0	2.5
3/4	7.5	5.0
1	10.0	5.0
1-1/2	---	7.5
2	---	10.0

(1) Measured with average reading DC ammeter.

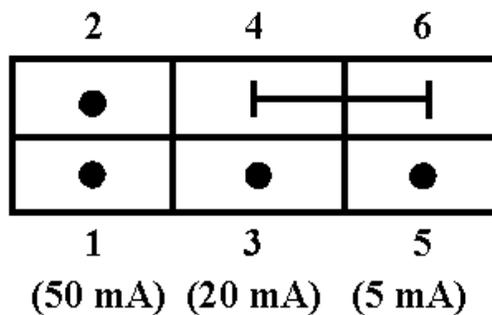
J8: Process Control Interface Jumper (Catalog Number 1365-PAN, 1365-PAF)

Note: This jumper is on process control interface controllers (Catalog 1365-PAN, 1365-PAF) and is factory set for a 10V input signal.

1. Select the J8 jumper position based on the process control signal to be used:

Process Control Signal	Jumper Position	Input Impedance
1 - 5 mA	5 mA (Pins 5 and 6)	2K Ω
4 - 20 mA	20 mA (Pins 3 and 4)	450 Ω
10 - 50 mA	50 mA (Pins 1 and 2)	200 Ω
0 - 10 V DC	10V (Pins 4 and 6)	666 Ω

Note: Rotate jumper 90° to select 5, 20, or 50 mA input signals.



J201: Minimum Speed Disable

ATTENTION: The drive is intended to operate at a predetermined minimum speed unless disconnected from the power source. If the application requires zero speed operation with power applied, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices. Failure to observe this precaution could result in bodily injury.

Note: A jumper is provided in a plastic bag shipped with the drive.

1. Place the jumper on position J201.
2. Turn MIN SPEED potentiometer fully counter-clockwise to obtain zero minimum speed.

J202: S-Curve Acceleration

Note: A 4.7 μ FD capacitor is provided in a plastic bag shipped with the drive.

1. Attach the capacitor to J202 (pins 1 and 2) if S-Curve acceleration characteristics are desired.

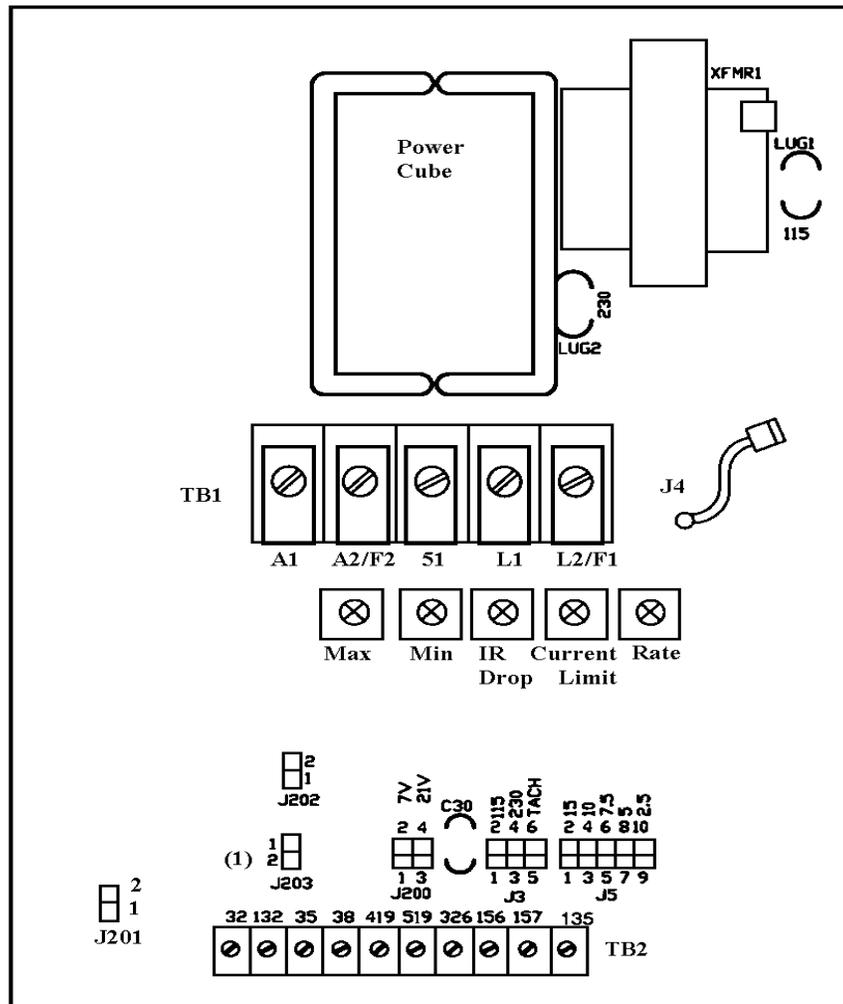
J203: Regulation Mode Jumper (Catalog 1365-SAN, 1365-SAF, 1365-DAF)

Do not move jumper J203.

J401: Rate Range Jumper (Catalog 1365-PAN, 1365-PAF, 1365-TAN, 1365-TAF)

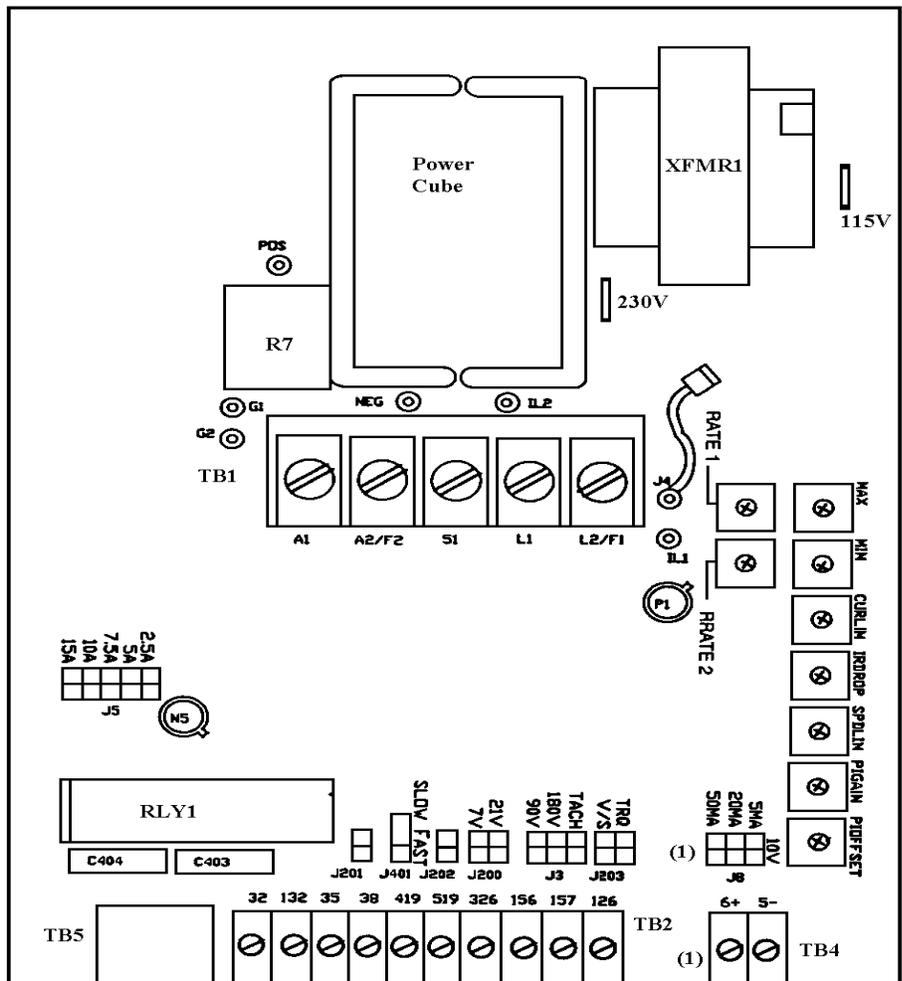
Note: This jumper is factory set for the slow rate range (upper and middle pins). The slow rate range is 3.5 to 40 seconds.

1. Select the fast rate range for better resolution. To select the fast rate range (0.3 to 3.5 seconds), move this jumper to the lower and middle pins.



(1) Do not use

Figure 1.1 Controller Circuit Board Jumper, Pin and Potentiometer Locations 1365-SAN, 1365-SAF, 1365-DAF.



(1) Functional on 0-57210-32 Regulator Boards only.

Figure 1.2 Controller Circuit Board Jumper, Pin and Potentiometer Locations 1365-PAN, 1365-PAF, 1365-TAN, 1365-TAF.

Startup and Adjust the Controller

Note: This procedure covers Speed Control, Process Control, and Torque Control controllers. Therefore, you will find references to “speed, process or torque” when the type of control is important.

1. Verify that the circuit board pots (Figure 1.2) are set as indicated below:

With Speed Control models:

- MAX - fully CCW
- MIN - fully CCW
- IR DROP - fully CCW
- CURRENT LIMIT - 50% of full scale
- RATE - 75% of full scale (A clockwise rotation decreases acceleration time and increases rate).
- PI GAIN (on Process Control models only) - fully CCW
- PI BIAS (on Process Control Models only) - fully CCW

With Torque Control models:

- MAX - fully CCW
- MIN - fully CCW
- IR DROP - fully CCW
- CURRENT LIMIT - 50% of full scale
- RATE 1 and RATE 2 - 75% of full scale
- PI GAIN (on Process Control models only) - fully CCW
- PI BIAS (on Process Control models only) - fully CCW
- SPD LIM - fully CCW

2. Set the operator's speed or torque potentiometer fully CCW.

3. If your controller includes process control, push the Automatic/Manual switch to Manual; otherwise proceed to Step 4.

4. If your controller includes a Forward/Off/Reverse switch, set the switch to the Forward position and proceed to Step 5.

ATTENTION: The remaining steps are made with power on. Exercise extreme caution as hazardous voltage exists. Failure to observe this precaution could result in severe bodily injury or loss of life.

5. Apply A-C input power.

6. Check the direction of motor rotation:

- Press Start and quickly press Stop to verify correct motor rotation. If the motor shaft doesn't rotate because all potentiometers are set to minimum levels, turn the Speed or Torque potentiometer slightly CW and repeat this start/stop operation.
- If motor shaft rotation is incorrect, press the Stop switch and wait for the motor to completely stop. Remove AC input power, and reverse the motor armature power leads A1 and A2 at the motor. Reapply AC input power and repeat the direction of rotation check.
- On applications utilizing DC tachometer speed feedback, when the direction of rotation of the motor is changed, the polarity of the tachometer also changes. The connection of the tachometer must remain 419 negative with respect to 519 for a given direction or rotation.

ATTENTION: The DC tachometer must be connected with the negative lead to terminal 419 and the positive lead to terminal 519 for the desired direction of rotation. Reverse connection will cause the motor to run at maximum uncontrolled speed. Failure to observe this precaution could result in severe bodily injury or loss of life.

7. On controllers employing DC tachometer speed feedback, the following steps may be used to determine the correct direction of rotation and the correct polarity of the DC tachometer speed feedback signal.

- Turn off power.
- Reconnect unit as a voltage regulator. Make sure J3 jumper is at the appropriate voltage level.
- Remove the DC tachometer leads from terminals 419 and 519, clearly marking the leads to distinguish one from the other, and connect a DC voltmeter (0 to 60 volt scale) to the DC tachometer leads.
- Turn on power.
- With the desired direction of motor rotation established, using the voltmeter that is connected to the DC tachometer signal leads, determine the polarity of the DC tachometer leads. Mark the negative polarity lead 419 and the positive lead 519.
- Stop the controller, remove AC power, replace the J3 jumper to the tachometer position and connect the DC tachometer leads to the controller as noted above, (-) 419 and (+) 519.

8. Adjust the speed or torque range:

ATTENTION: Do not depend on the minimum position of the speed or torque setting pot to stop the motor. In the minimum position, the controller and motor are still energized. The drive may restart unexpectedly. Turn off and lock out power when performing Startup operations that do not require power to the drive. Failure to observe this precaution could result in bodily injury.

With Speed Control models:

- Use a hand-held tachometer to monitor motor speed; or use a multimeter to measure armature voltage, which is approximately proportional to speed (115-volt control: 90V DC = 100% speed; 230-volt control: 180V DC = 100% speed).
- Press the Start button and slowly turn the Speed potentiometer to maximum (fully CW). The motor should run at about 50% of maximum.
- Slowly turn MAX CW until about 80% speed is reached.
- Turn the Speed potentiometer fully CCW.
- Since the MIN and MAX potentiometers interact, repeat the Speed Control procedure until the desired maximum and minimum speeds are reached.

With Torque Control models:

Torque control models must only be used when synchronizing this driven machine section with other process machine sections on which there is a drive that consistently and reliably establishes line speed.

- Load the motor with a reasonably constant load over the speed range. Such a system may be a preloaded dancer loop preceding a center driven winder. See Figure 1.3.
- Provide a means of measuring torque, such as measuring armature current. For example, for a 1 HP motor at 180V DC rated at a armature current of 5 amps and with a base speed of 1750 RPM:

$$\frac{1 \text{ HP} \times 5250}{1750 \text{ RPM}} = 3 \text{ ft-lbs}$$

Therefore, 5 amps equals 3 ft-lbs.

- Re-establish the torque load on the motor and load the motor to maximum torque.
- Press the Start button and slowly turn the Torque potentiometer to maximum (fully CW).
- Slowly turn SPD LIM potentiometer CW until measured torque no longer increases.
- Slowly turn MAX (CW) until the maximum desired torque is reached.
- Turn the torque potentiometer fully CCW.
- Slowly turn MIN CW until the minimum desired torque is reached.
- Since the MIN and MAX potentiometers interact, repeat this Torque Control procedure until the maximum and minimum torques are reached.

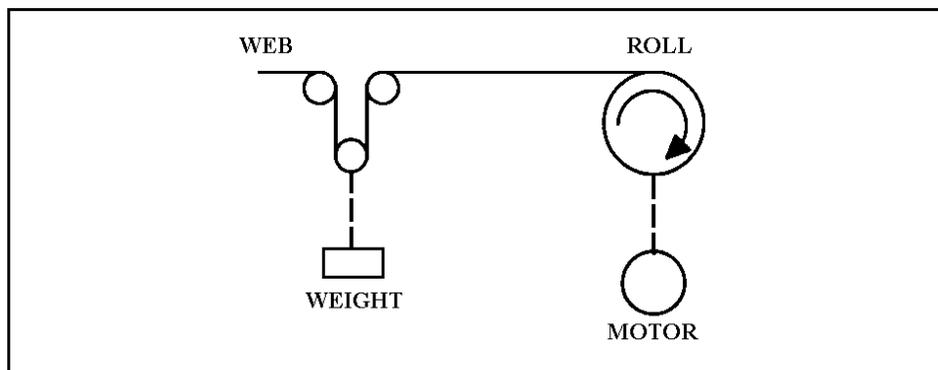


Figure 1.3 Pre-loaded Dancer Loop Preceding Winder.

9. Adjust the current or speed limit:

With Speed Control models:

The maximum DC current output from the controller with CURRENT LIMIT potentiometer set full CW is greater than 150%, possibly 200% maximum, of the J5 armature current setting. If 150% of the J5 armature current is excessive for the application or if stress on the driven equipment must be reduced, turn CURRENT LIMIT in the CCW direction until adequate setting is obtained.

With Torque Control models:

- With minimum load torque (motor disconnected or an empty winder roll without web), turn the Torque potentiometer fully CW and SPD LIM fully CCW.
- Adjust speed limit with SPD LIM for maximum desired motor application speed or 90/180V DC on the armature.
- Return the Torque potentiometer fully CCW.

10. Adjust the IR Comp:

With Speed Control models only: If the torque demand on the drive motor is relatively uniform, IR drop compensation is not required. Turn IR DROP to zero (CCW).

On models employing D-C tachometer speed feedback, the IR Drop Compensation potentiometer should be set at zero, fully CCW.

If the load torque is changing (i.e., a conveyor that can be empty and then some time later loaded with material), the increased load will cause a speed change. This speed change may be compensated with IR DROP (Figure 1.4). Turn IR DROP slightly CW until this droop is minimized. After adjusting IR drop compensation to minimize speed change with load the maximum and minimum speed settings should be rechecked for proper settings. Note that excessive IR drop compensation can cause motor instability and hunting. A tachometer should be used for better speed regulation.

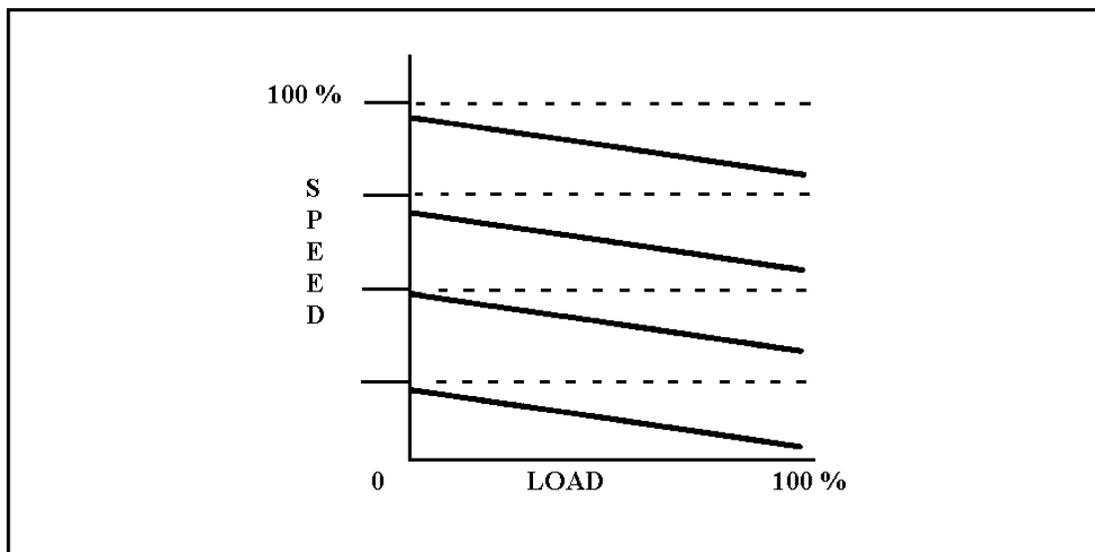


Figure 1.4 Fixed Speed Droop with Load Change.

With Torque Control models:

- IR drop compensation is used to reduce the speed rise above the speed limit threshold due to a loss of load torque.
- Turn IR DROP to minimize speed rise due to loss of load.
- Note that excessive IR drop compensation can cause motor instability and hunting. Motors that have a speed drop that varies excessively with operating speed cannot use IR drop compensation. A tachometer should be used for better speed regulation.

11. Press the Stop switch and wait for the motor to completely stop. Remove AC input power.

12. If you have a Process Control model, proceed to “Setup the Process Interface.”

Setup for Process Interface (For Catalog Number 1365-PAN, 1365-PAF)

Note: The process control input (plus and minus) is buffered from the armature circuit by 300K ohms of resistance. The buffered reference signal output on TB4-126 is positive with input TB4 (6 +) and TB4 (5 -). Inputs at TB4 (6 +) or TB4 (5 -) may be grounded or left ungrounded as required by the signal source equipment.

1. Disconnect power.

2. Push the Automatic/Manual switch to Auto.

ATTENTION: The process interface signal input terminals TB4 (6 +) and TB4 (5 -) are resistively isolated from line potential when AC power is connected. Disconnect and lockout all ungrounded conductors of the AC power line. Failure to observe these precautions could result in severe bodily injury or loss of life.

3. Verify that jumper J8 is properly positioned for your reference signal.

4. Apply AC input power and then press the Start button.

ATTENTION: Adjustment of the process interface bias potentiometer could result in zero speed operation of the controller. The drive is intended to operate at a predetermined minimum speed unless disconnected from the power source. If the application requires zero speed operation without such disconnection, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices. Failure to observe this precaution could result in bodily injury.

5. Command minimum reference from your process control unit and adjust PI BIAS to the desired minimum operating speed or torque.

6. Increase the process control reference signal to maximum and adjust PI GAIN to the desired maximum operating speed or torque. It may be necessary to repeat Steps 5 and 6 until proper maximum and minimum speed or torque are attained because these adjustments interact.

7. Press the Stop switch and wait for the motor to completely stop.

Adjust Rate Potentiometer(s)

For Catalog 1365-SAN, 1365-SAF, 1365-DAF

Adjust pot RATE for desired acceleration and deceleration

For Catalog 1365-PAN, 1365-PAF

Adjust RATE 1 and RATE 2 for desired acceleration and deceleration rates.

For Catalog 1365-TAN, 1365-TAF:

1. Set J401 for Fast or Slow rate range:

Note: F (Fast) setting is used for finer resolution at faster rates.

S (Slow) - 3.5 to 40 seconds

F (Fast) - 0.3 to 3.5 seconds

2. Adjust RATE 1 for the desired acceleration rate.

3. Adjust RATE 2 for the desired deceleration rate.