# RSC671
Ramped Speed Control

1   OVERVIEW

The RSC671 Ramped Speed Control module provides full time, linear, electronic variable speed setting. The module smoothly accelerates and decelerates an engine at an independently adjustable rate, softening speed changes and preventing current spikes. Ramping is useful in limiting smoke and noise associated with a step change in engine speed.

Ramped Speed Controller regulates acceleration/deceleration during speed changes from idle speed to rated speed by opening and closing a switch contact, keeping the engine as close as possible at the desired set speed.

Applications include variable speed engine drives, a wide speed range of pumping systems, and special vehicles that require controlled speed acceleration and deceleration.

The RSC671 accepts speed setting signals from an external voltage source, potentiometer, or a 4-20 mA process control source. Contact GAC for 0 - 20 mA applications.

The RSC671 must be paired with a compatible speed controller: ESD5100, ESD5200, ESD5300, and ESD5500 Series speed control units from GAC. This manual details installation of the RSC671 with each of these controllers.
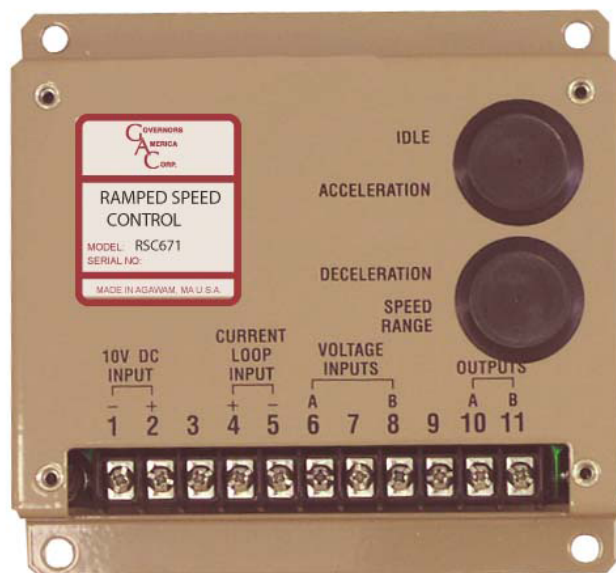
2   SPECIFICATIONS

| PARAMETER		SPECIFICATION	
Ramp Time Acceleration		MIN:	0.125 s
		MAX:	2.40 s
	Deceleration	MIN:	0.125 s
		MAX:	3.60 s
Ramp Time with 30 kΩ Acceleration resistor between E1 to E2		MIN:	0.15 s
		MAX:	5.00 s
	Deceleration	MIN:	0.125 s
		MAX:	7.60 s
Speed Control Range		1.0 ± 0.05 to 5.8 V DC ± 0.2	
Input V DC - Terminals 1/2		0 - 10 V DC ± 0.1	
mA - Terminals 4/5		4 - 20 mA ± 0.05	
Output (Terminal 9)		0.4 V DC @ 4 mA to 5.7 V DC @ 20 mA	
Output (Terminal 10)		2.6 V DC - 7.4 V DC	
Output (Terminal 11)		1.3 V DC - 3.7 V DC	
Input Impedance (Terminal 6)		> 10 KΩ	
DC supply voltage (Terminal 1)		10 V DC from speed control unit	

3 INSTALLATION

The RSC is ruggedly built. Install as close as possible to its paired speed control unit.

The unit is best mounted vertically to allow moisture to drain. Most installations are within a local cabinet, not engine mounted and within close proximity to corresponding controller.

The RSC671 is compatible with GAC ES-D51XX, ESD52XX, ESD53XX, and ES-D55XX Series speed control units.
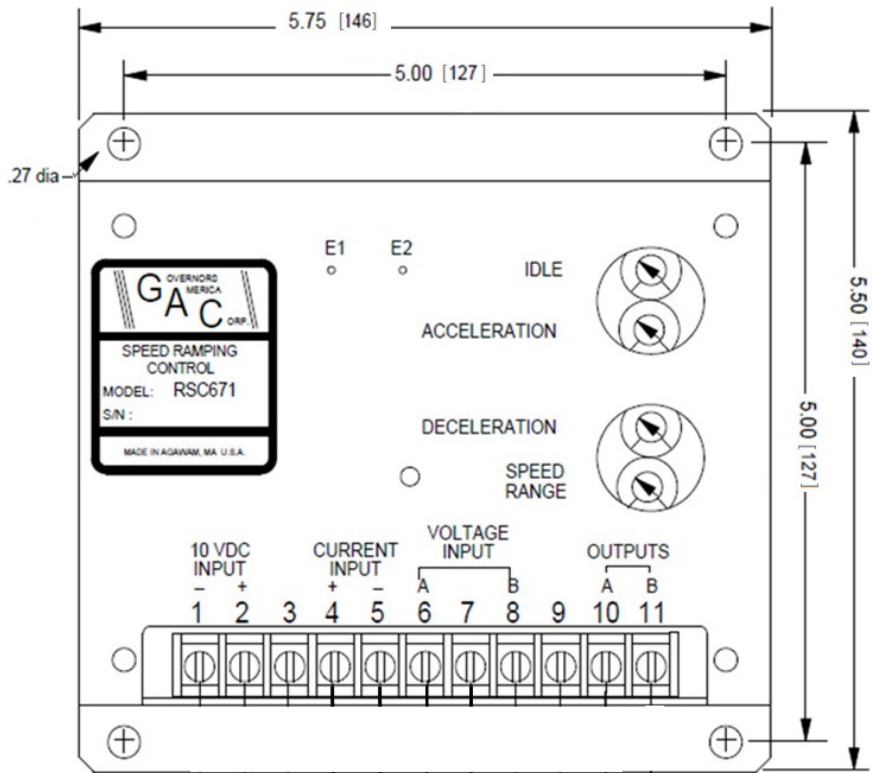
Dimension Units	
X.XX	in
[X.X]	[mm]

4 WIRING

Details on wiring the RSC Series to an ESD Series speed control unit is detailed in this section. The following general wiring applies. Input can either be supplied by current or voltage, with wiring dependent on the input.

1. Speed setting signals to the RSC must be provided by one of three inputs:
    • direct 10 V DC input (provided by speed control unit)
    • potentiometer
    • 4 - 20 mA input

    If 0 - 20 mA applications are needed, see your GAC representative for details.

2. Wiring over 3 ft [1 m] requires increased wire size to minimize voltage drops.

4. Speed range is available from both Terminal 10 and Terminal 11. Terminal 10 offers twice the speed range of Terminal 11.

5. To cut the ramp speed range and further smooth ramping, add a jumper between Terminals 8 and 9 to narrow the voltage range.

6. Wiring between the RSC671 and ESD controllers vary. Note the wiring information in the following sections for your specific ESD controller.

7. A noise filter is recommended between the battery and the unit. GAC PN FL100.

See your actuator's installation guide for available wiring harness options to improve overall results.

4 - 20 mA CURRENT CONTROL WIRING FOR RSC671 TO ESD51XX, ESD52XX, ESD5500

Wiring current input between **RSC671 and ESD51xx, 52xx, and 55xx Series**, uses the following connections:

1. Connect Ground from ESD Terminal G to RSC Terminal 1.
2. Connect positive source to Terminal 4, and the negative source to Terminal 5. Jumper Terminals 6 and 7.
    No other connection should be made to Terminal 6. Terminal 7 provides 4-20 mA output.
3. Connect Terminal 2 on RSC671 to ESD 10 V Terminal P son ESD51XX, 52XX, 55XX
4. To connect ramp and idle circuits jumper Terminals 8 and 9.
5. For droop connect terminals J and M on the ESD.
6. Connect Terminal 10 (or 11) to ESD IDLE, ESD51XX, ESD52XX, ESD55XX Terminal L

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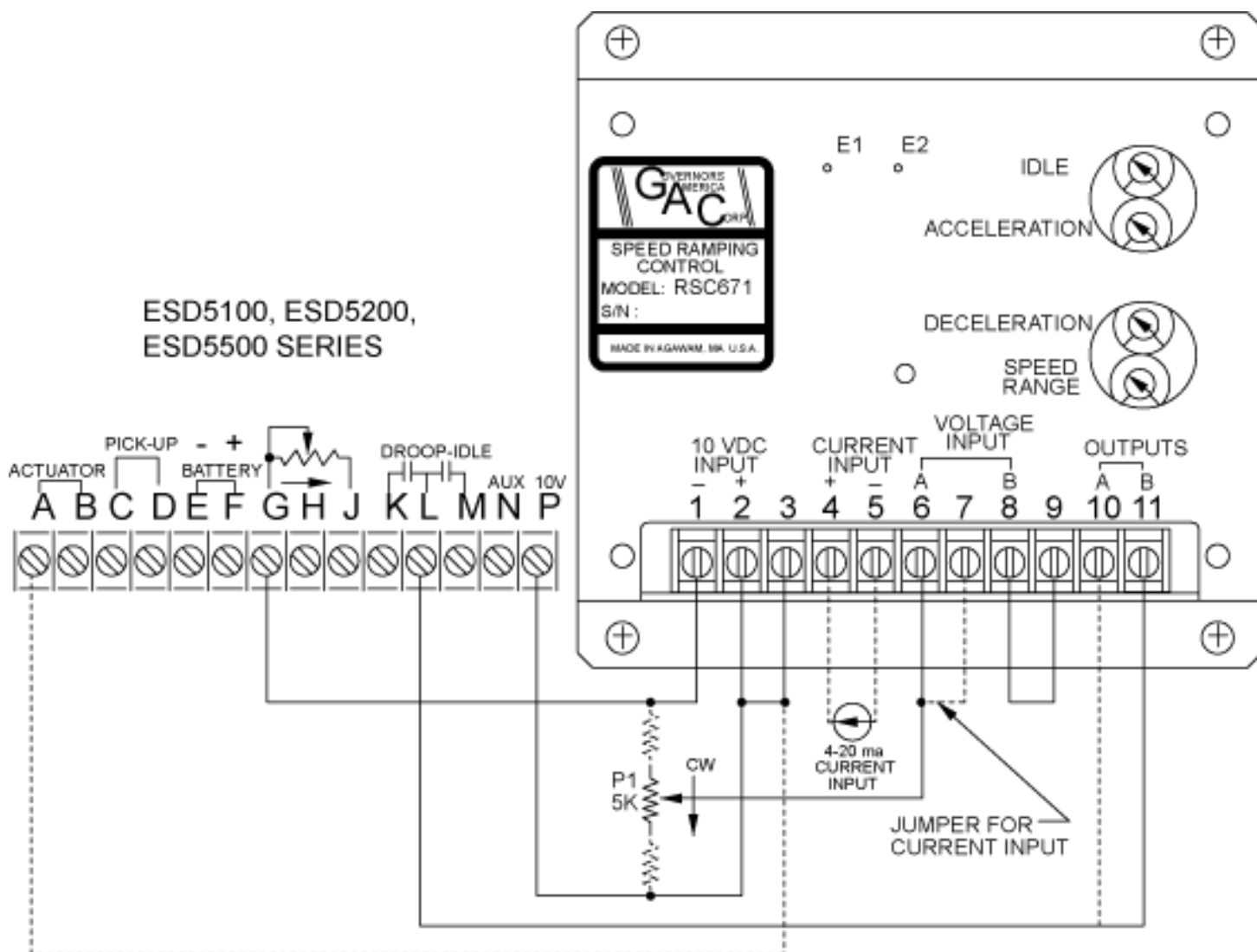
4 - 20 mA CURRENT CONTROL WIRING FOR RSC671 TO ESD5330

Wiring current input between **RSC671 and the ESD5330**, make the following connections:

1. Connect Ground from ESD Terminal G to RSC Terminal 1.

2. Connect positive source to Terminal 4, and the negative source to Terminal 5. Jumper terminals 6 and 7.
   No other connection should be made to Terminal 6. Terminal 7 provides 4-20 mA output.

3. Connect Terminal 2 to ESD 10 V Terminal L

4. To connect ramp and idle circuits jumper Terminals 8 and 9.

5. For droop connect terminals J and M on the ESD.

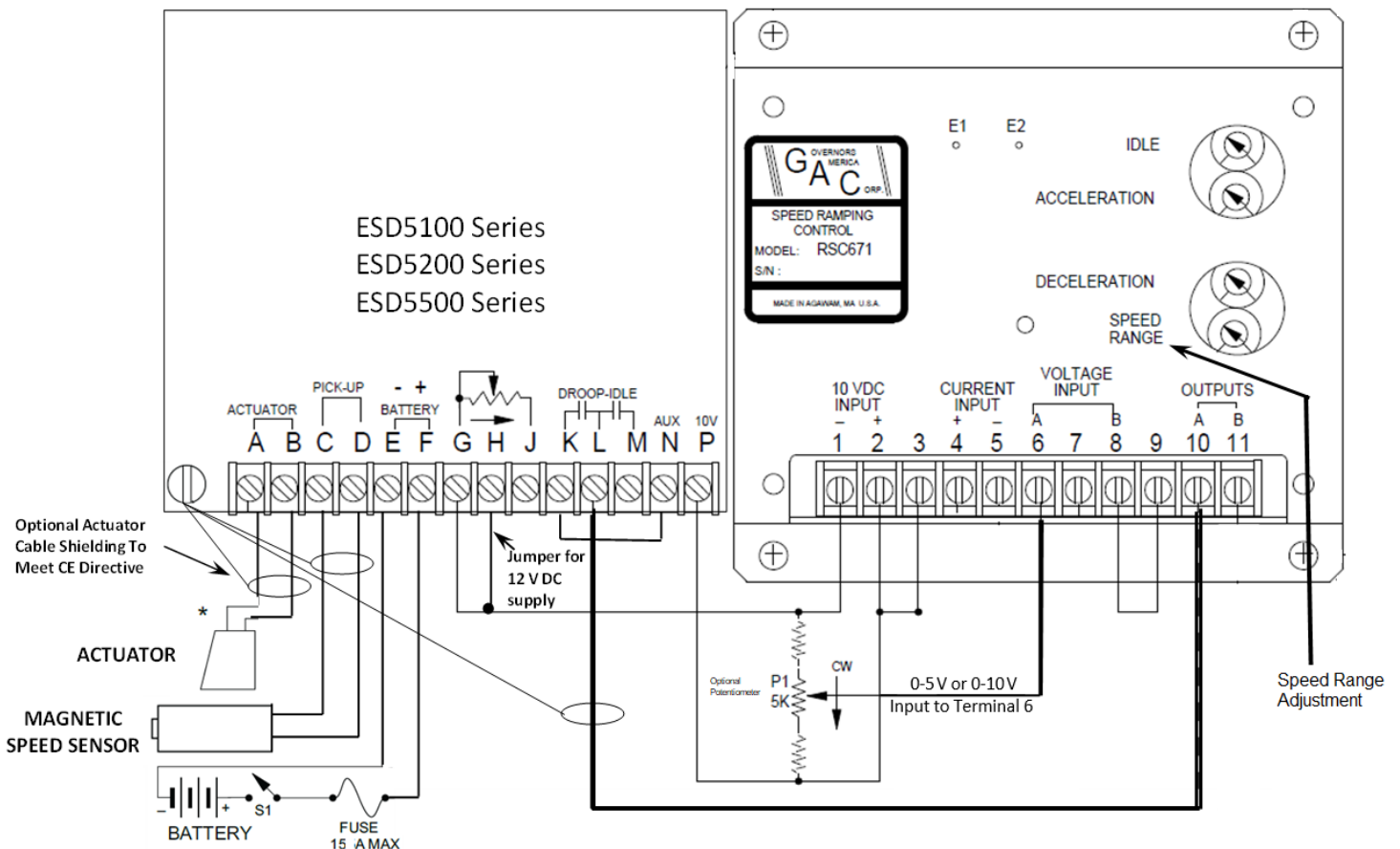6. Connect Terminal 10 (or 11) to ESD IDLE, Terminal N

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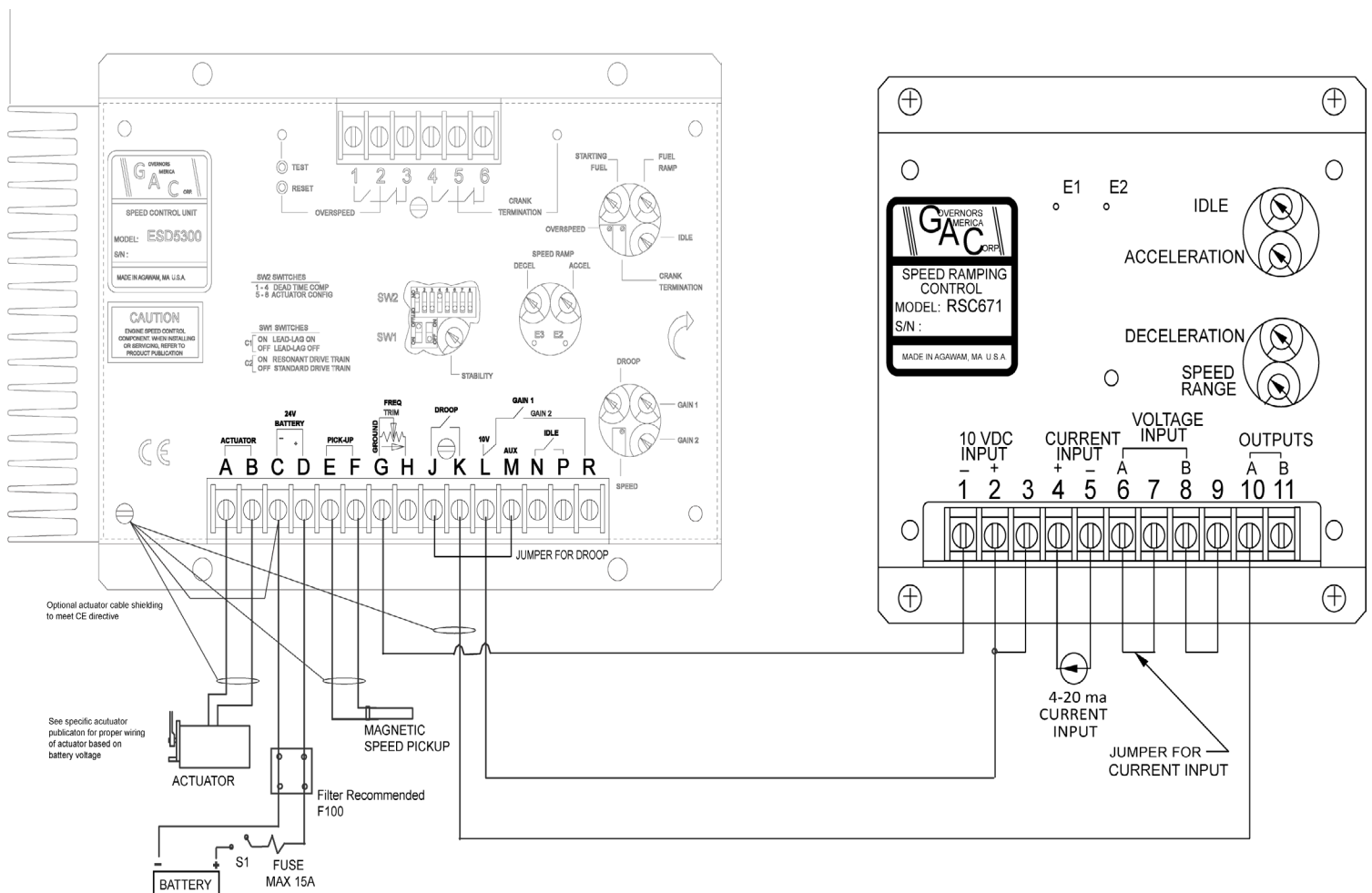
VOLTAGE INPUT WIRING ESD51xx, ESD52xx, ESD5500 to RSC671

Wiring voltage input between the **RSC671 and ESD51xx, ESD52xx, ESD5500** make the following connections:

1. Power the RSC671 by connecting RSC671 Terminals 2 (+) to ESD 10 V (Terminal P) and RSC671 Terminal 1 (—) to ESD Terminal G.
2. If using a 12 V DC power supply, add a jumper between Terminal G and H.
3. Connect Terminal 10 or 11 to ESD Terminal L on the ESD speed control unit.
4. Connect a jumper wire between RSC671 Terminal 2 and 3 for voltage input.
5. Connect RSC671 Terminal 6 to a potentiometer or other speed input source such as a foot pedal. Terminal 6 is the voltage input for speed control.
6. To narrow the voltage range jumper RSC671 Terminals 8 and 9.

⚠️ The ground potential (GP) of current input (ESD Terminal E and RSC671 Terminal 5) must equal ESD BATTERY—, Terminal E.

CONNECT TERMINALS K AND N ON THE ESD IF DROOP IS REQUIRED.

VOLTAGE INPUT WIRING FROM RSC671 to ESD5330

Wiring voltage input between the **RSC671 and the ESD5330** make the following connections:

1. Power the RSC671 by connecting RSC671 Terminals 2 (+) to ESD 10 V (Terminal L) and RSC671 Terminal 1 (—) to ESD Terminal G.
2. If using a 12 V DC power supply, add a jumper between Terminal G and H.
3. Connect Terminal 10 or 11 to ESD Terminal L on the ESD speed control unit.
4. Connect a jumper wire between RSC671 Terminal 2 and 3 for voltage input.
5. Connect RSC671 Terminal 6 to a potentiometer or other speed input source such as a foot pedal.
6. To narrow the voltage range, jumper RSC671 Terminals 8 and 9.

⚠️ Ground potential of current input (ESD Terminal E and RSC671 Terminal 5) must equal ESD BATTERY —, Terminal 5.

- Connect RSC671 Terminals 2 and 3 when using Voltage input.
- Jumper ESD5330 Terminal J ad M for Droop.
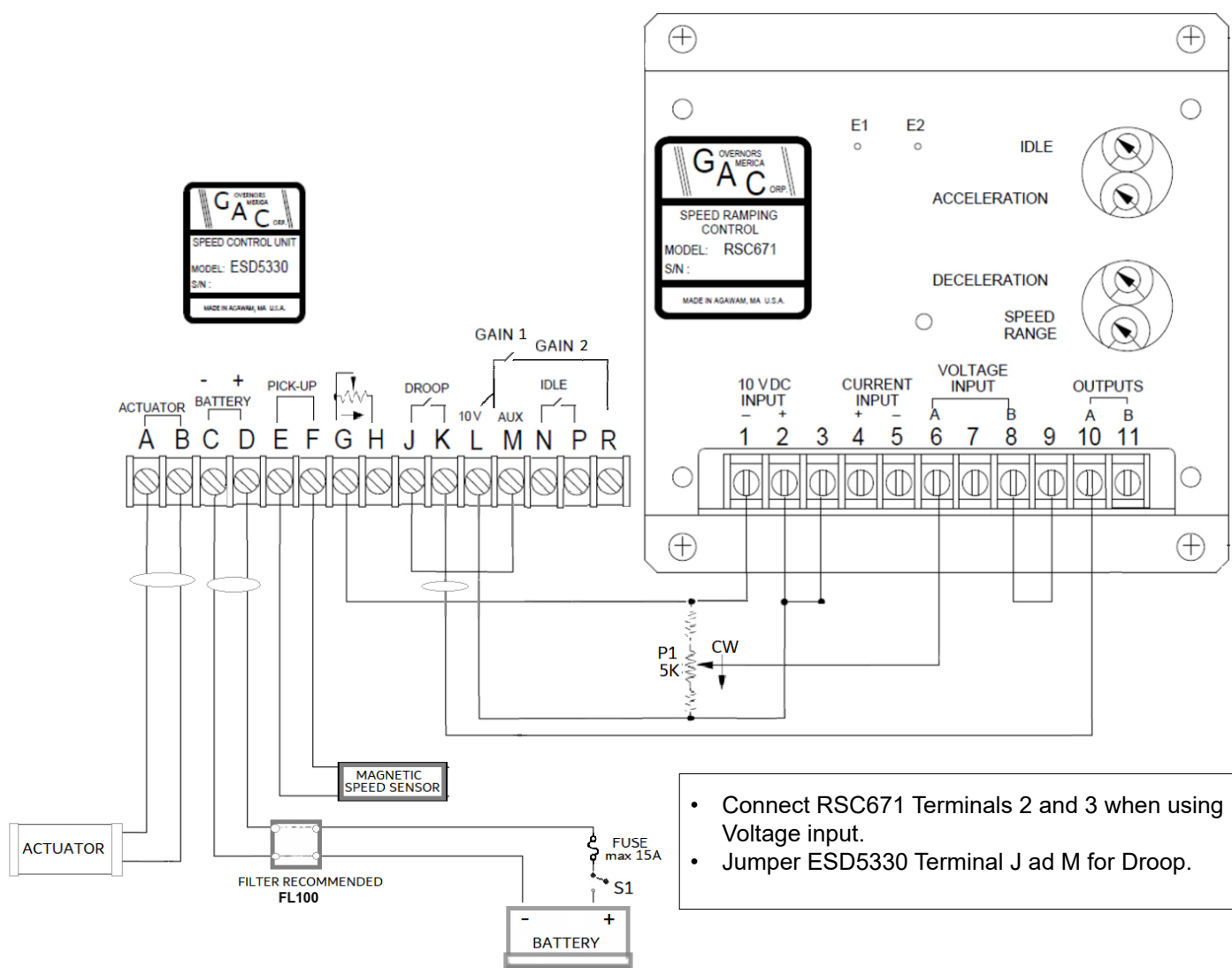
5   INITIAL START AND ADJUSTMENTS

Before integrating the RSC into your engine, optimize engine performance . See your speed controllers documentation for details. Let the engine warm up to operating temperature.

- Depending on the controller settings (gain and reset time) response time will be faster or slower to control errors.
- **ACCELERATION** sets the time required for the control to ramp the engine speed from idle speed to rated speed. The time is set from 0 to 500 seconds.
- **DECELERATION** sets the time required for the control to ramp the engine speed from rated speed to idle speed.
- Ramp time from rated to idle is always less than 1 second, regardless of the setting on the connected ramp potentiometer.

INITIAL SETTINGS for RSC and ESD 51XX, 52XX, or 55XX

1. Disconnect RSC671 Terminal 10 or 11.
2. On the ESD:
   - Set the SPEED potentiometer to approx 80% of rated speed. The ESD controllers use a 25-turn potentiometer and may require several turns to adjust.
   - Set Speed Ramp to fully CCW (0) and Start Fuel to fully CW (100%).
   - Set Idle on ESD to MAX.
3. Make sure the input, either 0-5 V DC, 0-10 V DC or 4-20 mA, is at the lowest value.
4. Reconnect RSC671 Terminal 10 or 11.
5. Set potentiometers on RSC671:
   - IDLE to 100%
   - ACCELERATION to 50%
   - DECELERATION to 50%
   - SPEED RANGE to 100%
6. Start the engine. Increase the ESD SPEED potentiometer CW until the engine runs at high idle with no load.
7. Match the idle speed of the ESD to the idle setting on the RSC671 (5 V DC, 10 V DC or 20 mA).
8. Set rated speed:
   - Adjust the rated speed using the SPEED RANGE potentiometer on the RSC671.
   - Adjust ramp time using ACCELERATION and DECELERATION. To decrease ramp time turn the DECELERATION potentiometer clockwise.
8. Recheck idle speed and rated speed settings by setting the input of the RSC671 to minimum setting (potentiometer at 0 setting) and recheck the settings. You may need to increase RAMP SPEED on the RSC or SPEED on the ESD and recheck several times to create the desired ramp results.

INITIAL ADJUSTMENTS USING CURRENT INPUT

When using current input:

1. Set the input to 4 mA.
2. Adjust IDLE for the desired speed.
3. Increase the current input to 20 mA.
4. Adjust SPEED RANGE to the rated speed. Speed range may be set between 0 and 50. Above 50 output saturation goes to RSC Terminal 9.
5. Adjust IDLE speed as required then recheck rated speed.

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ADJUSTING SPEEDS USING VOLTAGE INPUT

1. Set idle speed by applying 0 volts to Terminal 6 (Speed) and adjusting IDLE on the RSC671 to the rated speed. A voltage change to Terminal 6 will increase voltage at either terminal 10 or 11.

2. Adjust the overall desired speed range using the SPEED RANGE potentiometer adjustment to match the voltage to a desired speed. For example, 5 V DC can equate to 2100 RPM. Input voltage of 1.0 to 10.0 V DC will cover most speed ranges. Adding resistors to one end or both will enable you to extend speed ranges.

3. Apply input voltage corresponding to maximum speed and adjust SPEED RANGE until the rated speed is reached.

4. Readjust idle as needed. Recheck rated speed.

5. Continue to adjust rated speed and idle until satisfied with results.

ADJUSTING RAMP TIME

Ramp time, the time it takes to reach the ramp setting, is controlled by acceleration and deceleration adjustments on the RSC671. Acceleration sets the amount of time it takes to get to the next speed setting. Deceleration sets the amount of time to move to the next lower setting.

Adjust the RAMP TIME potentiometer to achieve satisfactory acceleration to rated speed with minimum overshoot.

A clockwise (CW) adjustment **decreases** the ramp time.

INCREASING RAMP TIME

If additional ramp time is required, connect a 30 k Ω resistor between posts El and E2 of the RSC to double the ramp time. Remove the screws that hold the circuit board in the case to access posts El and E2 as described in Section Wiring, Increasing Ramp Time.

Ramp acceleration and deceleration capabilities can be increased by adding a 30 k Ω resistor (30K) to the RSC671 board. This update must follow electro static discharge (ESD) procedures, experience in hand soldering, and take place in a clean area.

1. To add the resistor:

   a. Following local electrostatic discharge guidelines, and taking care to not drop the PC board, carefully remove the 4 screws and star washers holding the insulator cover on the rear of RSC671. Save all hardware.

   b. Remove the insulator cover. Remove PC board from casing, placing it on a clean work surface, terminal side up.

   c. Install the 30 k Ω resistor between posts E1 and E2. Ensure the resistor lies well below the RSC cover to prevent shorting.

   d. Replace the board in the casing.

   e. Replace the screws, tightening only enough to secure the board (10 -14 in-lbs [1.129 - 1.58 N·m]). Do not over tighten.