


## Electric Actuator Smart Controller Microprocessor Based Analog Positioner SCC05 - 115/230A Technical Manual

### Features

- Mounts internally in:  
RCS actuator models: MAR-10, MAR-50, MAR-90,  
MAR-100, MAR-160, MAR-250, MAR-800 & all  
SurePowr models.  
Andco actuator models: Eagle, 7000, 8000, QR and QRG.
  - Onboard LED display facilitates setup and calibration  
using the EASC Menu Setup.
  - Menu selection of input/output ranges including 4-20  
mA<sub>dc</sub>, 1-5 V<sub>dc</sub>, 2-10 V<sub>dc</sub> and 0-10 V<sub>dc</sub>, or virtually any  
custom range required.
  - Automatic calibration: no resistors to add, no jumpers,  
trimming potentiometers or DIP switches to adjust.  
Calibration is as simple as pressing a button.
  - Three relay outputs: fault, full closed and full open.
  - Menu selectable fail options.
  - Intelligent positioning reduces motor cycling, increases  
motor life and extends the actuator duty.
  - Auto jog feature. Constantly corrects and refines the  
positioning accuracy.
- 
- Quick disconnect terminal strips facilitate fast and easy  
actuator maintenance and troubleshooting.
  - Always wires the same; no need to determine rotation  
direction during installation; rotation is selected using  
the EASC Menu.
  - Robust power switching components, designed specifi-  
cally for actuator motors, virtually eliminate field  
failures.

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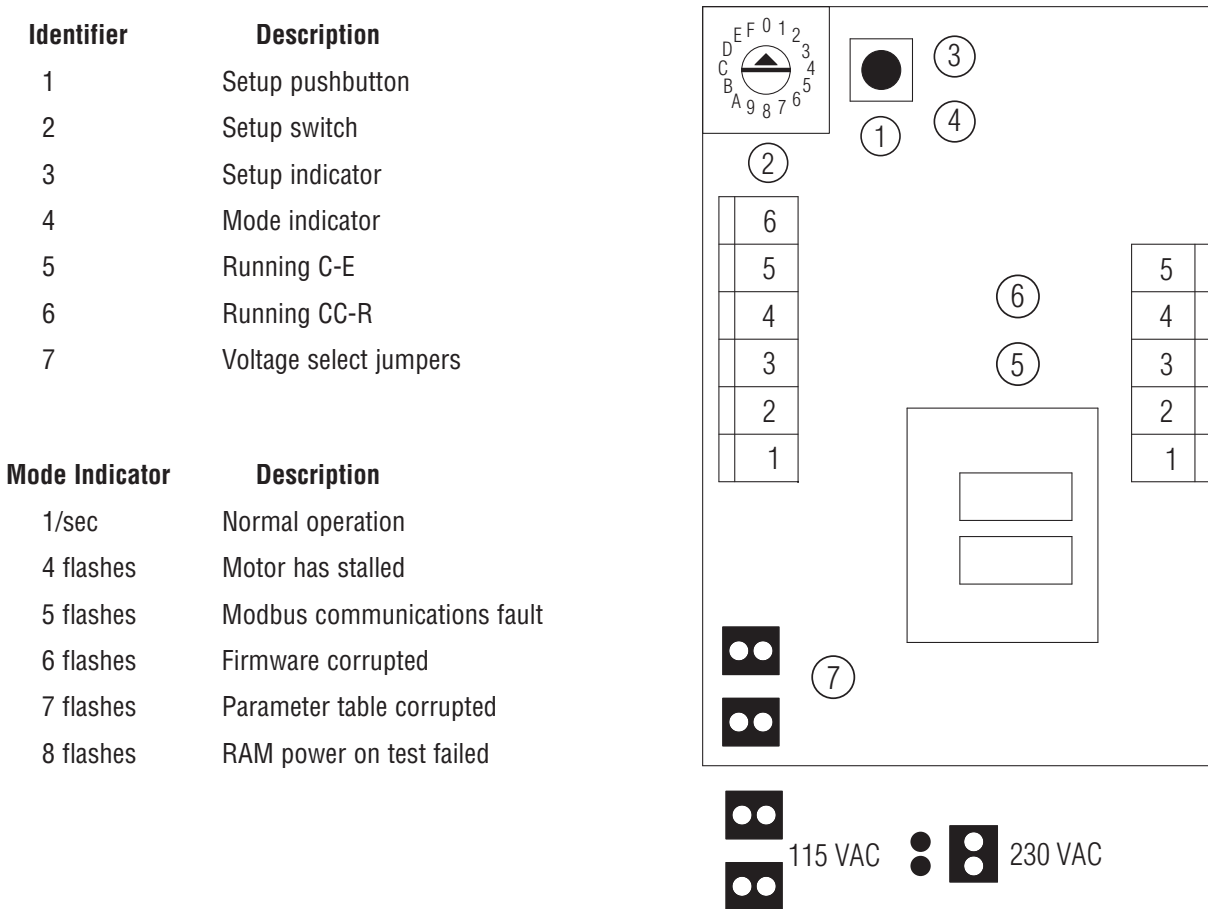
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## 1. Installation Notes

**NOTE 1:** The following instructions assume that the SCC05 is installed in the actuator and all safety, installation and startup instructions outlined in the appropriate RCS and ANDCO installation and instruction manuals have been carried out. Be certain the actuator is in proper operating condition before attempting to calibrate the SCC05 controller. During the setup operation the actuator will not move in response to process signal changes. The actuator will move to the requested process signal position when setup is exited.

**NOTE 2:** The terms “clockwise” and “counterclockwise” refer to the direction of rotation of the actuator output shaft, for setup actuators, as viewed from the top of the actuator. For linear actuators, the term “extend”, rod moving away from the body of the actuator, and “retract”, rod moving into the body of the actuator, refer to the direction of movement of the extension rod. The SCC05 is always wired as shown in the Wiring Diagram. Output rotation, for setup actuators, or extension rod direction of movement, for linear actuators, is changed using Parameter 2.

## 2. Indicators and Operators



## 3. Quick Set Instructions

Setup of the SCC05 uses a setup pushbutton and a 16 position setup switch.

The operation of the setup system is as follows:

1. To enter setup mode, press and hold the setup pushbutton until the setup indicator illuminates, then release the pushbutton;
2. Select the parameter to adjust using the setup switch;

3. Press the setup pushbutton momentarily, the setup indicator will flash slowly. If applicable the mode indicator will flash out the current setting for the parameter;
4. Use the setup switch to select the value or position the actuator;
5. To save the setting, press and hold the setup pushbutton until the setup indicator flashes quickly, then release the pushbutton;
6. To exit the parameter without changing the setting, press the setup pushbutton momentarily;
7. Return to step 2 to adjust the next parameter;
8. To exit setup, set the setup switch to 0 and momentarily press the setup pushbutton.

Switch Position	Parameter	0	1	2	3	4	5	6	7	8	9	A	B	C	D
0	Exit														
1	Set input		4-20mA	0-10V	1-5V	2-10V	Custom 0	Custom FS	Modbus						
2	Rotation to open			CCW	CW										
3	Pot setup			Run CCW	Stop	Run CW	(The mode indicator will illuminate at 50% input)								
4	Set fully closed				Run CCW	Stop/Set	Run CW								
5	Set fully open					Run CCW	Stop/Set	Run CW							
6	Stall delay		0.1 sec	0.2 sec	0.5 sec	1 sec	2 sec	5 sec	10 sec	Custom					
7	Input failsafe level/ Modbus com fault time		1	2	5	10	20	50 None	Set level						
8	Failsafe position							No move	Run CW	Stop/Set	Run CCW				
9	Deadband		1	2	3	4	5	6	7	8	9	10	15	20	Auto
A	Sensitivity		0.1 sec	0.2 sec	0.5 sec	1.0 sec	2.0 sec	5.0 sec	Custom						
B	Smoothing		2	4	8	16	32	64	128	256	512				
C	Smoothing override		1	2	5	10	20	50	100	200	500				
D	Modbus address	Select address tens, press and hold, select address units, press and hold													
E	Modbus serial speed		1200	9600	19200										
F	Load defaults		Set												

**Note:** For parameters 6 and A press and hold the setup pushbutton for the desired time, between 2 seconds and 100 minutes. The parameter will be set to the time the pushbutton is pressed.

**CAUTION:** for parameters 3, 4, 5 and 8, the actuator will move immediately if the switch position is changed.

#### 4. Operation of the Setup System

Setup of the SCC05 uses a setup pushbutton and a 16 position setup switch. The operation of the setup system is as follows:

1. To enter setup mode, press and hold the setup pushbutton until the setup indicator illuminates, then release the pushbutton;
2. Select the parameter to adjust using the setup switch;
3. Press the setup pushbutton momentarily, the setup indicator will flash slowly. If applicable, the mode indicator will flash out the current setting for the parameter;
4. Use the setup switch to select the value or position the actuator;
5. If a setting is required, press and hold the setup pushbutton until the setup indicator flashes quickly, then release the pushbutton;
6. To exit the parameter without changing the setting, press the setup pushbutton momentarily;
7. Return to step 2 to adjust the next parameter;
8. To exit setup, set the setup switch to 0 and momentarily press the setup pushbutton.

## 5. Description of Parameters

There are 15 parameters that can be adjusted to tailor the operation of the SCC05 to your application. Parameters 1 through 5 must be set before the actuator is placed in service.

### 5.1 Parameter 0 – Exit Setup Mode

To exit setup, set the setup switch to 0 and momentarily press the setup pushbutton. The setup indicator will go off and the mode indicator will again flash at a 1 second rate indicating normal operation.

### 5.2 Parameter 1 – Select Process Input Type

The SCC05 has a fully flexible process signal input. It has a built-in 250Ω load resistor for current loop applications. If you require a custom process signal input range, first select the type of input, either voltage or current, before setting your custom range. When setting a custom range, always set the signal 0 level first, then the full scale level.

The mode indicator flash sequence will indicate the current selection.

Switch Position	Process Signal Input
1	Preset the process signal input to 4-20mA current loop
2	Preset the process signal input to 0-10VDC voltage input
3	Preset the process signal input to 1-5VDC voltage input
4	Preset the process signal input to 2-10VDC voltage input
5	Set a custom process signal 0 level. Connect a process calibrator to the input of the SCC05. Set the process calibrator to the required 0 signal level. Press and hold the setup switch until the setup indicator flashes quickly.
6	Set a custom process signal full scale level. Connect a process calibrator to the input of the SCC05. Set the process calibrator to the required full scale signal level. Press and hold the setup switch until the setup indicator flashes quickly.
7	Modbus RTU control, analog input is disabled

The input failsafe level will automatically be set to 2% below the process signal 0 level if type 1,3 or 4 is selected. You must set the input failsafe level if a custom process 0 level is set.

### 5.3 Parameter 2 – Set Direction of Rotation

The SCC05 should be installed and wired as shown in the drawings regardless of the required direction of rotation. This parameter allows for the changing of rotation direction without rewiring the actuator.

Switch Position	Set Direction of Rotation
2	Counter clockwise to open operation
3	Clockwise to open operation

## 5.4 Parameter 3 – Adjust the Actuator’s Potentiometer

To assist with the adjustment of the potentiometer, this setting allows the movement of the actuator, both clockwise and counterclockwise, with indication of the potentiometer’s mid point position. The mode indicator will be illuminated when the potentiometer signal is above 50%.

**Caution: the actuator will move immediately when the switch position is changed.**

Switch Position	Adjust Potentiometer Operation
2	Run the actuator in the counter-clockwise direction
3	Motor is stopped
4	Run the actuator in the clockwise direction

## 5.5 Parameter 4 – Set Fully Closed Position

The SCC05 has a highly accurate position algorithm that employs dynamic braking. In most cases this system will provide better positioning accuracy than the mechanical limit switches provided with the actuator. The actuator’s fully closed mechanical limit switch should be set to open slightly past the desired fully closed position. The SCC05’s fully closed setting will then stop the actuator at the most accurate fully closed position.

The fully closed position is most accurately set by running the actuator motor in the close direction as the last operation before saving the fully closed value. Run the actuator in the open direction and then run towards fully closed. This will remove any gear and potentiometer backlash.

**CAUTION: the actuator will move immediately when the switch position is changed**

Switch Position	Set Fully Closed
3	Run the actuator in the counter-clockwise direction
4	Motor is stopped
5	Run the actuator in the clockwise direction

Press and hold the setup pushbutton until the setup indicator flashes quickly to save the fully closed position.

## 5.6 Parameter 5 – Set Fully Open Position

The SCC05 has a highly accurate position algorithm that employs dynamic braking. In most cases this system will provide better positioning accuracy than the mechanical limit switches provided with the actuator. The actuator’s fully open mechanical limit switch should be set to open slightly past the desired fully open position. The SCC05’s fully open setting will then stop the actuator at the most accurate fully open position.

The fully open position is most accurately set by running the actuator motor in the open direction as the last operation before saving the fully open value. Run the actuator in the close direction and then run towards fully open. This will remove any gear and potentiometer backlash.

**CAUTION: the actuator will move immediately when the switch position is changed**

Switch Position	Set Fully Closed
4	Run the actuator in the counter-clockwise direction
5	Motor is stopped
6	Run the actuator in the clockwise direction

## 5.7 Parameter 6 – Set Stall Delay

The SCC05 can detect when there is no change on the potentiometer input during a seek operation. This parameter determines the delay before the actuator motor is stopped should there be no potentiometer motion. The following is a table of preset stall delays:

Switch Position	Stall Delay	Switch Position	Stall Delay
1	0.1 sec	5	2.0 sec
2	0.2 sec	6	5.0 sec
3	0.5 sec	7	10.0 sec
4	1.0 sec	8	Custom time

A custom stall time can be set using the following procedure:

1. Set the setup switch to 6 and press and release the setup pushbutton;
2. Set the setup switch to 8;
3. Press and hold the setup pushbutton for the desired stall delay (minimum of 2 seconds, maximum of 100 minutes);
4. Release the pushbutton.
5. The custom stall time will be set to the time the pushbutton was held down.

## 5.8 Parameter 7 – Set Input Failsafe Level / Modbus Communication Timeout

The SCC05 sets the default input failsafe level at 2% below process level 0 when input modes 1, 3, 4 or custom settings are selected. This value can be changed using the following procedure;

1. Set the setup switch to 7 and press and release the setup pushbutton;
2. Set the setup switch to 7;
3. Connect a process calibrator to the input of the SCC05. Set the process calibrator to the required failsafe signal level.
4. Press and hold the setup pushbutton until the setup indicator flashes quickly;
5. Release the pushbutton. The input failsafe value is now saved.

When used with a Modbus RTU control system, this parameter sets the communications fault timeout time. The timeout time is set using the following table:

Switch Position	Modbus Communication Fault Timeout
1	1 sec
2	2 sec
3	5 sec
4	10 sec
5	20 sec
6	50 sec
7	No time out

## 5.9 Parameter 8 – Set Process Signal/Modbus Timeout Failsafe Position

The SCC05 sets the default process signal failsafe position to 0 when input modes 1, 3, 4 or custom settings are selected. Move the actuator to the desired location or select 6 for no move. This parameter is set using the following procedure:

**CAUTION: the actuator will move immediately when the switch position is changed**

Switch Position	Set Fully Closed
6	No move on failsafe condition
7	Run the actuator in the clockwise direction
8	Motor is stopped
9	Run the actuator in the counter-clockwise direction

Press and hold the setup switch until the setup indicator flashes quickly, and then release the pushbutton, to save the failsafe position.

## 5.10 Parameter 9 – Set Actuator Deadband

The highly accurate positioning and automatic deadband algorithms allow for very sensitive positioning operations. Under certain conditions it may be desirable to widen the deadband of the SCC05.

The setting is in internal units or 1 part in 1024. The following table describes the available deadband settings:

Switch Position	Deadband	Switch Position	Deadband
1	1	8	8
2	2	9	9
3	3	A	10
4	4	B	15
5	5	C	20
6	6	D	Automatic
7	7		

Automatic mode determines the deadband by the rate change in the process signal during the Sensitivity Time. The deadband is adjusted to remove signal changes that occur during this time to prevent actuator chatter caused by short time process signal variations.

### 5.11 Parameter A – Set Actuator Sensitivity

The SCC05 has dynamic braking allowing for fast transitions between clockwise and counter clockwise moves. Under some circumstances it may be desirable to impose a time delay between moves. This selection allows the imposition of a preset delay between moves.

The following table describes the available time delays:

Switch Position	Time Between Operation
1	0.1 sec
2	0.2 sec
3	0.5 sec
4	1.0 sec
5	2.0 sec
6	5.0 sec
7	Custom time

A custom sensitivity delay can be set using the following procedure:

1. Set the setup switch to A and press and release the setup pushbutton;
2. Set the setup switch to 7;
3. Press and hold the setup pushbutton;
4. Hold the pushbutton for the desired sensitivity delay (minimum of 2 seconds, maximum of 100 minutes);
5. Release the pushbutton;
6. The custom sensitivity time will be set to the time the pushbutton was held down.

### 5.12 Parameter B – Set Input Smoothing

The SCC05 has a process signal smoothing algorithm. This feature can be used to reduce movement caused by process signal hunting or noise on the process signal input. The smoothing is accomplished using an averaging algorithm. The number of averages taken is selected by this parameter.

The mode indicator flash sequence will indicate the current selection. The following table describes the process signal smoothing options:

Switch Position	Number of Averages	Switch Position	Number of Averages
1	2	6	64
2	4	7	128
3	8	8	256
4	16	9	512
5	32		

### 5.13 Parameter C – Set Smoothing Override

The SCC05 has a process signal smoothing algorithm. This feature can be used to reduce movement caused by process signal hunting or noise on the process signal input. The smoothing is accomplished using an averaging algorithm. The result of heavy averaging is to reduce the response time of the controller. This can be improved by setting an override level. The override level disables the averaging system when the process input moves an amount greater than the override setting. This insures fast response to large signal changes. The process signal has an internal accuracy of 1 count in 1024.

The mode indicator flash sequence will indicate the current selection. The following table describes the process signal smoothing override options:

Switch Position	Override Counts	Switch Position	Override Counts
1	1	6	50
2	2	7	100
3	5	8	200
4	10	9	500
5	20		

### 5.14 Parameter D – Set Modbus RTU Address

Each device on a Modbus RTU network requires a unique address. The controller can be set to any address from 1 to 99. To set the address:

1. Set the setup switch to D and press and release the setup pushbutton;
2. Set the setup switch to ten's address value and press and hold the setup pushbutton until the setup indicator flashes quickly, then release the pushbutton;
3. Set the setup switch to unit's address value and press and hold the setup pushbutton until the setup indicator flashes quickly, then release the pushbutton;

Changes to the Modbus address take effect immediately.

### 5.15 Parameter E – Set Modbus Communications Baud Rate

The Modbus serial communications baud rate can be set to 1200, 9600 or 19200 baud. The following table describes the serial communications speed options:

Switch Position	Modbus Baud Rate
1	1200
2	9600
3	19200

## 5.16 Parameter F – Set Factory Defaults

The SCC05 can be returned to factory settings using this function. To set the factory default values:

1. Set the setup switch to F and press and release the setup pushbutton;
2. Set the setup switch to 1 and press and hold the setup switch until the setup indicator flashes quickly, then release the pushbutton;

The following table describes the factory default values:

Parameter	Default Value
Input	4-20mA
Rotation	CCW to open
Stall delay	1 sec
Failsafe signal offset	-2%
Failsafe position	0
Deadband	10
Sensitivity	1.0 sec
Smoothing	8
Smoothing Override	10
Modbus Address	1

## 6. Optional Modbus Control

The SCC05 is fully Modbus enabled. The RS485 Option Board is required for Modbus communications. The controller is a Modbus RTU slave. The address and baud rate can be set using the setup system described in this document.

There are 4 Modbus registers assigned:

Register word	Description	Type
40001	Status	Read Only
40002	Process value	Read Only
40003	Command	Read / Write
40004	Setpoint	Read / Write

## 6.1 The Status Register

The status register is read only. The status register bit assignments are:

Bit	Status
0	Move in progress
1	Move direction is clockwise
2	Flash memory protect is on
3	Motor has stalled, move incomplete
5	Controller firmware is corrupted
6	Parameter flash memory is corrupted
7	Controller RAM failed initial memory test
8	In setup mode

## 6.2 Process Value

The process value register is read only. The process value is scaled to a full scale range of 1024. The register provides the current position of the actuator.

## 6.3 The Command Register

The command register is read/write. The command register bit assignments are:

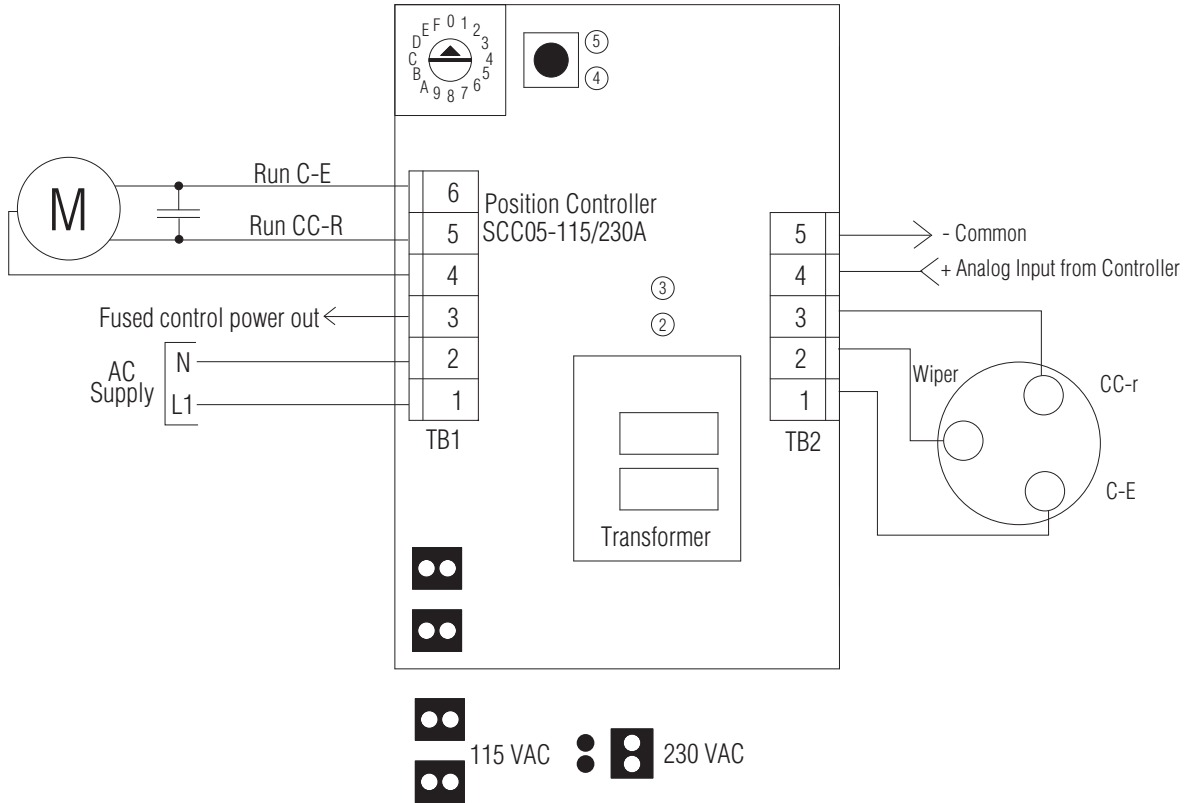
Bit	Command
0	Stop
1	Go to full open
2	Go to full closed
3	Go to setpoint
4 - 15	Always write as 0

To execute a command, set the command bit to 1. Command bits are automatically cleared after command execution.

## 6.4 The Setpoint Register

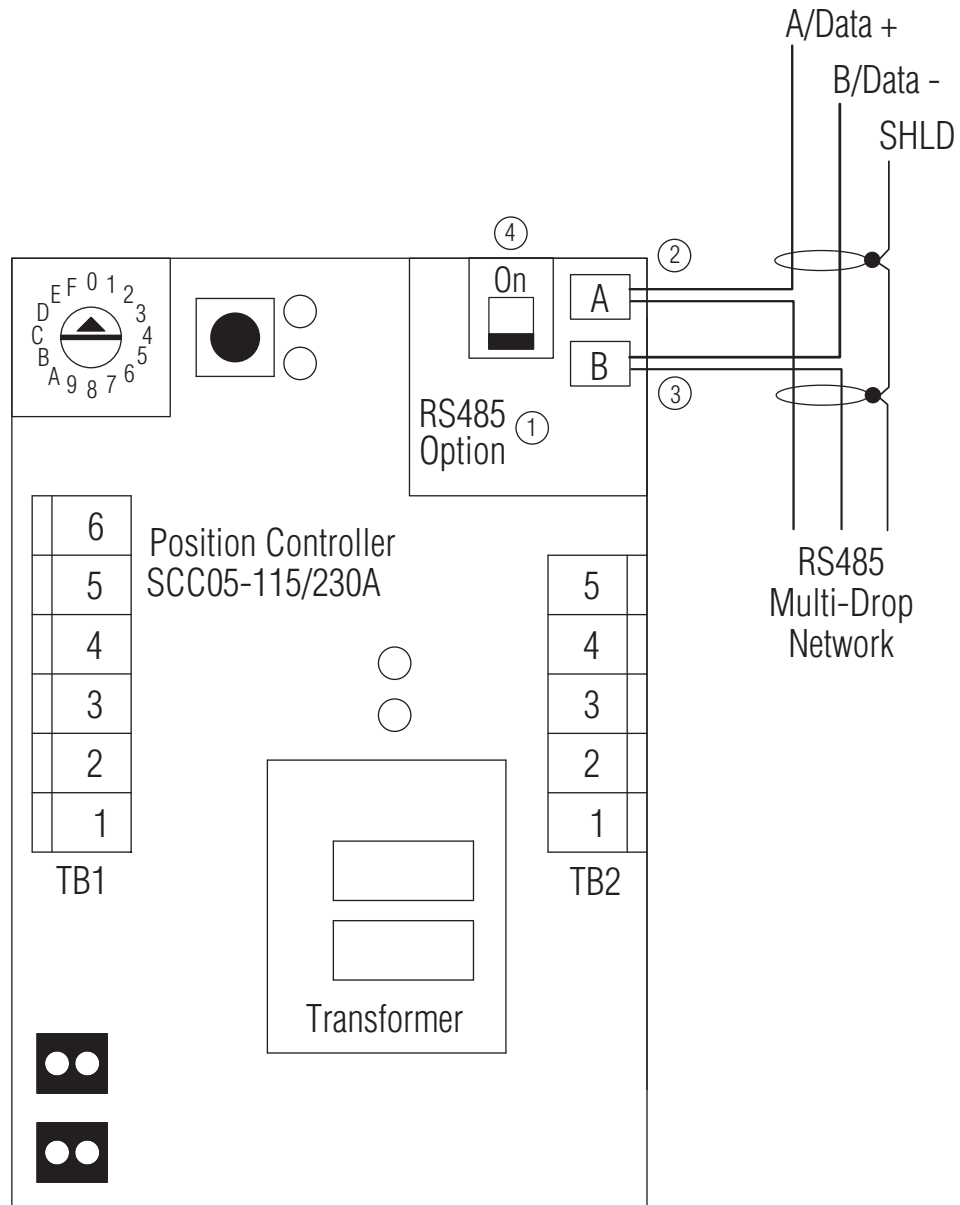
The setpoint register is read/write. To position the controller, write the setpoint to the setpoint register and then set the "Go to setpoint" command in the command register. The setpoint and command register can be modified during a single write.

## 7. Wiring Diagram



Notes:

1. C-E (clockwise or extended) and CC-R (counter-clockwise or retracted) refer to the movement of the output shaft, viewed from the top of the actuator
2. Red indicator on indicates motor running in C-E direction
3. Green indicator on indicates motor running in CC-R direction
4. Mode indicator, flashes at 1 second rate for normal operation, see setup instructions, for details
5. Setup indicator, illuminates only when in setup mode, see setup instructions for details



Notes:

1. RS485 Option Board required for Modbus RTU Operation
2. RS485 terminal strip is removable and does not break the network
3. Twist wires together before inserting in terminal strip
4. Termination is required for the last device on the network. To terminate the network at an SCC 05, turn the RS485 option board terminateswitch on. All other SCC 05s must have the terminate switch off.



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